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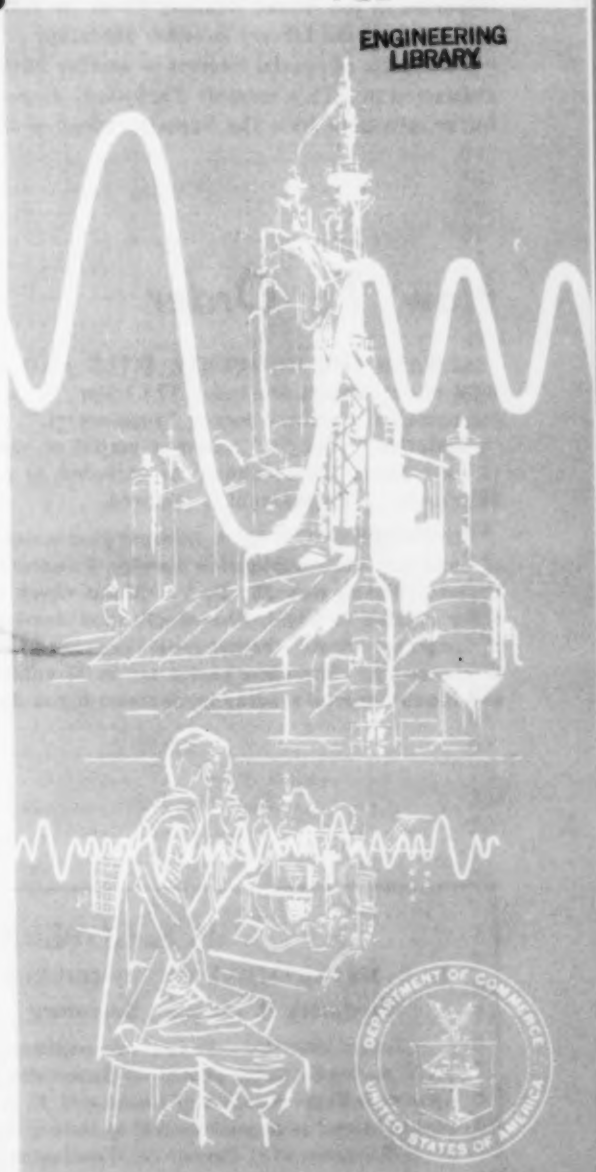

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Mass spectrometer system for materials: research summary report. Phase I. July 59. 31p. (PB 161 073) $1.00 96

U. S. Government RESEARCH REPORTS

U. S. DEPARTMENT OF COMMERCE

OFFICE OF TECHNICAL SERVICES

Vol. 33, No. 1 Pp. 1-110 January 15, 1960

ASTRONOMY

Astrophysics

Air Force Cambridge Research Center, Bedford, Mass.
THEORETICAL ANALYSIS OF THE PAR-SCOPE: AN OSCILLOSCOPE DISPLAY FOR WEATHER RADARS, by Edwin Kessler, III. July 59, 37p. 20 refs. Instrumentation for Geophysics and Astrophysics no. 12; AFCRC-TR-59-244.
Order from OTS $1.00 PB 161 100

The PAR-Scope, an oscilloscope display for use with pulsed radars and fluctuating targets, uses gated averaged amplitude information as one coordinate and azimuth or elevation as the other coordinate; its display is a profile of the average reflectivity of the target for the radar waves. The PAR-Scope is operated with a scanning antenna, permitting simultaneous operation with the Range-Height Indicator or Plan-Position display. Such combinations provide means for rapid three-dimensional quantitative mapping of average reflectivity in the vicinity of the radar, and should be of importance in studies seeking to relate the distributions of radar weather echoes to the air motions. Theoretical analysis of PAR-Scope performance considers the response of the scanning system to spatial variations of average reflectivity and to the rapid fluctuations characteristic of weather echoes. It is shown that reflectivity distributions of major interest can be easily represented to an accuracy within 1 db of that implicit in the radar calibration.

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
BIBLIOGRAPHY OF EXTRATERRESTRIAL RADIO NOISE: SUPPLEMENT FOR 1952, by Martha Stahr Carpenter. Rept. on Contract N6onr-401(22). 15 Apr 58, 89p. 134 refs. Research rept. EE-371.
Order from LC mi$4.80, ph$13.80 PB 143 350

See also PB 135 731

Harvard Coll. Observatory [Cambridge, Mass.]
THE OPERATION OF A SOLAR OBSERVATORY AT SACRAMENTO PEAK, NEW MEXICO, by Donald H. Menzel, Henry J. Smith and Barbara Bell. Final rept. on Contract AF 19(604)146. 22 Dec 58, 34p. 55 refs. AFCRC TR-58-288.
Order from LC mi$3.00, ph$6.30 PB 138 810

Miscellaneous Operations included the improving of the photographic laboratory, devising of new processing techniques, and general collaboration on standardization of photographic procedures. Considerable new work has been done in the field of optical engineering, toward the long-range improvement of existing equipment and the construction of new accessories. Some attention given to the problem of automatic data reduction. Solar-Terrestrial Correlations studies have been carried on relative to geomagnetism, corona, sunspots, flares, and various terrestrial ionospheric effects. Theoretical developments in magnetohydrodynamics, the dynamics of ionized media, collision processes and shock waves, torsional oscillations and solar magnetic fields have simplified and clarified many important subjects. Another important theoretical study has been the development of new techniques for calculating the intensities of spectral lines of complex atoms.

Lowell Observatory, Flagstaff, Ariz.
THE COLOR-MAGNITUDE DIAGRAM OF THE PLEIADES CLUSTER II, by H. L. Johnson and R. I. Mitchell. Final rept. on Contract Nonr-1674(00) [1958] 17p. 13 refs.
Order from LC mi$2.40, ph$3.30 PB 138 610

Two or three-color photographic and photoelectric photometry of virtually all of the known members of the Pleiades cluster is given. The photographic photometry was done on plates taken with the 13-inch telescope, while the photoelectric work was done with the 21-inch and 42-inch reflectors of the Lowell Observatory. We believe that a number of the stars that were previously thought to be members of the Pleiades are actually not members. We find a total of 262 members and 27 probable brighter than $V = 16$. No white dwarfs were found; they would have been if they were brighter than $M_V = 11.8$. A sudden increase in the width of the main sequence is observed at $V = 12.0$. This scatter may be associated with the probable fact that the fainter stars

are still in the process of gravitational contraction. A "flare" of one faint Pleiades star was observed, and five other faint stars are thought also to be "flare" stars. It is suggested that the "flare" activity might be connected with the process of gravitational contraction of young late-type stars.

Manchester U. (Gt. Brit.).
RESEARCH ON MOON ECHO PHENOMENA, by J. V. Evans. Final technical rept. for 1 May 56-1 May 59 on Contract AF 61(514)947. [1959] 33p. 23 refs. AFCRC-TR-59-184.
Order from LC mi$3.00, ph$6.30 PB 143 520

The research work summarized is concerned with the study of radio reflections from the moon. Results have been obtained both at 100 Mc/s and 120 Mc/s which indicate that at these frequencies the moon behaves as a quasi-smooth reflector such that 50% of the returned power is reflected from a region at the centre of the visible disc having a radius of about 1/10th of the moon's radius. The echoes show long period fading which has been attributed to the magneto-ionic effect in the earth's ionosphere. By observing this fading on two close spaced frequencies it has been possible to obtain measures of the total electron content of the ionosphere. These results indicate that for most of the time there are three times the number of electrons above the height of the critical frequency to the number below. Hence the ionosphere must extend to about 1,000 kms. above the surface of the earth.

Minnesota U. School of Physics, Minneapolis.
AURORAL X-RAYS, COSMIC RAYS AND RELATED PHENOMENA DURING THE STORM OF FEBRUARY 10-11, 1958, by J. R. Winckler, L. Peterson and others. Nov 58, 36p. 12 refs.
Order from LC mi$3.00, ph$6.30 PB 143 418

Balloon observations were made during the auroral storm of February 10-11, 1958 at Minneapolis. Strong x-ray bursts in two groups were detected. The groups appeared coincident with two large magnetic bays, with strong radio noise absorption, and with the passage across the zenith of a very large array of auroral luminosity. From the x-ray intensity and measured energies an electron current of 0.6×10^6 electrons/cm^2/sec is present. These electrons ionizing the upper D-layer account for the increased cosmic noise absorption. The x-rays themselves are 1000 times less intense and do not provide sufficient ionization. Visual auroral forms during this storm are reported to have lower borders at the 200-300 km level. There is thus a difficulty in bringing the electrons to the D-layer without an accompanying visible aurora. A cosmic ray decrease accompanied the storm and was observed to be from 4% to 6% at sea level, 21% in the balloon altitude ionization, and 15% in total energy influx at 55° geomagnetic latitude. Compared to the great intensity of the magnetic and auroral phenomena in this storm, the cosmic ray modulation is not exceptionally large.

Northwestern U., Evanston, Ill.
A STUDY OF THE STARS IN THE ORION CLUSTER (1) [AND] A STUDY OF THE GALACTIC CLUSTER h PERSEI (2) by K. Aa. Strand. Final rept. on Investigation and Research in Astronomy, Contract Nonr-2115(00). Oct 58, 5p.
Order from LC mi$1.80, ph$1.80 PB 143 707

Brief comments were made on the several directions of research.

Ohio State U. Research Foundation, Columbus.
RELATIVE SOLAR INTENSITY OBSERVATIONS AND ATMOSPHERIC TRANSMISSION OF STARLIGHT, by Roger Hosfeld, George J. Neilson, and J. Allen Hynek. Final rept. on Contract AF 19(604)2039. 1958, 22p. 1 ref. RF proj. 717; AFCRC TR-58-259.
Order from LC mi$2.70, ph$4.80 PB 139 169

Under this contract a photoelectric photometer was developed for measuring the surface brightness of the sun by comparison with the intensity of stars during the daytime. A stepwise method of decreasing the solar signal was incorporated into the procedure. The signal reduction was accomplished by the use of objective and focal plane diaphragms, optical scattering, and electronic attenuation, with each step subject to calibration. The photometer also permits photoelectric examination of solar surface details of the order of 3 seconds of arc in diameter. Stellar scintillation studies carried out during this investigation were primarily concerned with the variations in scintillation signals observed through a rectangular aperture at different orientations in azimuth, and their relationship to wind direction and velocity in the earth's upper atmosphere. A compact, specialized telescope developed for this purpose utilized a rotating rectangular section of an off-axis parabolic mirror of 24-inch focal length.

BEHAVIORAL SCIENCES

Aero Medical Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
TRACKING PERFORMANCE AS A FUNCTION OF FEEDBACK SPECIFICITY, by Darwin P. Hunt. Rept. on Criteria for the Design and Arrangement of Displays. Mar 59, 39p. 8 refs. WADC Technical rept. 58-584; AD-212 311.
Order from OTS $1.00 PB 161 070

The research reported herein was conducted to determine (a) the relationship between complex compensatory tracking and the specificity of displayed error, i.e., the number of categories of error information, and (b) the extent to which this relationship is influenced by task difficulty and amount of practice. Tracking error and control motion were the criterion measures. The results suggest that (a) linear increments in the number of categories of error information result in a negatively accelerated reduction in the tracking error; (b) as the operator becomes more proficient, the superiority of the greater number of categories is reduced; (c) the effects of the number of cateogries of information on control motion depends upon the difficulty of the task; and (d) although the amount of control motion generally decreases as the operator be-

comes more proficient, the magnitude of this decrease is greater for the "easy" task than for the "difficult" task.

School of Aviation Medicine, Randolph AFB, Tex.
CHANGES IN PLASMA CORTICOSTEROIDS AND BICARBONATE AS A RESULT OF PILOTING SUPERSONIC AIRCRAFT, by Henry B. Hale, James P. Ellis and Clyde H. Kratochvil. Apr 59, 5p. 10 refs. Rept. 59-61.
Order from LC mi$1.80, ph$1.80 PB 143 742

While flying high-speed military aircraft, pilots frequently hyperventilate to a degree sufficient to induce marked alkalosis. Psychogenic factors are thought to be responsible for the hyperventilation. Comparison was made of pre- and postflight plasma bicarbonate (determined titrimetrically) and corticosteroid levels (Sweat's technic) for 20 instructor pilots and 47 student pilots flying F-100 aircraft for 50 minutes. No differentiation of students and instructors was possible on the basis of either pre-or postflight values; therefore, the data for the two groups were combined. The plasma bicarbonate value following the flight was 1.1 ± .24 mEq./liter (mean ±S.E.) lower than before the flight. Free 17-hydroxycorticosterone was increased 5.8 ± .70 μg./100 ml., while conjugated 17-hydroxycorticosterone increased 5.7 ± .75. The free corticosterone-like fraction increased 3.1 ± .34 μg./100 ml., while the conjugated corticosterone-like fraction increased 3.2 ± .35. Each of these changes was significantly different from zero ($P < .001$). No statistically significant correlation was found between the fall in bicarbonate and any of the increases in steroid fractions.

Personnel and Training

Human Resources Research Office, George Washington U., Washington, D. C.
THE DEVELOPMENT OF JOB DESCRIPTIONS FOR NIKE AJAX BATTERY OFFICERS, by Charles L. Darby, William F. Brown and others. Rept. on [Contract DA 49-106-qm-1]. Apr 59, 81p. Technical rept. 54.
Order from LC mi$4.80, ph$13.80 PB 143 565

This study is the first stage of a research project designed to determine the level of skill and knowledge required of officers assigned to NIKE AJAX batteries, so that courses of instruction can be scientifically devised to train officers for maximum effectiveness. Job descriptions were developed for the positions of Battery Commander, Battery Executive Officer, Integrated Fire Control Platoon Leader, and Launcher Platoon Leader. Information was obtained from experienced battery officers, based on the job descriptions, through check-list responses indicating the training needs associated with selected activities. The activities judged most important for all four officer positions were: serving as battery control officer, insuring equipment readiness, and training and evaluating operators.

Institute of Personality Assessment and Research, U. of California, Berkeley.
THE USE OF TRAIT RATINGS IN AN ASSESSMENT OF 100 AIR FORCE CAPTAINS, by Donald G. Woodworth and Donald W. MacKinnon. Rept. on Contract AF 18(600)08. Sep 58, 44p. 17 refs. WADC-TN-58-64; AD-202 845.
Order from LC mi$3.30, ph$7.80 PB 143 386

As part of a project for developing officer assessment techniques, 30 rating dimensions were used by 10 raters to record their psychological evaluations of 100 captains. A cluster analysis of these ratings yielded three reliable cluster scores. Analyses indicated that the three cluster scores could be defined as measuring general effective intelligence, personal soundness and assessability, and effective leadership. The three cluster scores did not correlate significantly with available Air Force criterion evaluations of the subjects. When the subject officers were differentiated on the basis of being rated or nonrated, it was found that the correlations between cluster scores and two of the criteria rose to levels which were significant within the rated group. This was interpreted as an indication that differentiation on the criterion side of the relationship is needed for significant advancement toward an understanding of the Air Force officer personnel evaluation variables, or the relating of psychologically meaningful measures to these criteria.

Naval Personnel Research Field Activity, San Diego, Calif.
DEVELOPMENT AND STANDARDIZATION OF WOMEN'S MECHANICAL TEST FORM 6W, by Bernard Rimland and John H. Steinemann. Dec 58, 18p. 3 refs. BuPers Technical Bulletin 58-14.
Order from LC mi$2.40, ph$3.30 PB 143 254

MECH 6W represents an improvement over the previous test used for Waves in several respects. The raw score mean on the 100 item MECH 6W is 49, as compared with 36 on the previous test. Only four per cent of Waves tested fell below the chance level on MECH 6W as compared with 22 per cent on the previous test. The standard deviation has been raised from 8.11 to 10.94. The correlation between MECH 6W and the previous test is .80 for a sample of 300 Waves and .91 for a sample of 412 male recruits. (These coefficients are to some extent inflated by an overlap of items in the two tests, however). Adoption of MECH 6W for the testing of Wave recruits appears warranted.

Naval Personnel Research Field Activity, San Diego, Calif.
EFFECT OF EXTRANEOUS NUMERICAL INFORMATION ON THE U. S. NAVY ARITHMETIC TEST, by Bernard Rimland. March 59, 17p. 5 refs. BuPers Technical Bulletin 59-4.
Order from LC mi$2.40, ph$3.30 PB 143 252

The subtests containing extraneous information tended to be less homogeneous (i.e., to have smaller variances, Kuder-Richardson reliabilities and smaller item-test correlation coefficients) than the subtests composed of the same items without extraneous information. The findings of this research do not support

the inclusion of extraneous information in arithmetic reasoning items if a relatively pure and homogeneous measure of arithmetic reasoning is desired, as is the case in the Navy Arithmetic Test.

Naval Personnel Research Field Activity, San Diego, Calif.
EFFECTS OF TIME LIMITS AND OF "RIGHT ANSWER NOT GIVEN" IN THE U. S. NAVY ARITHMETIC TEST, by Bernard Rimland. May 59, 18p. 6 refs. BuPers Technical Bulletin 59-5.
Order from LC mi$2.40, ph$3.30 PB 143 253

The use of "right answer not given" as a possible response to the arithmetic reasoning items was not found superior to the use of five numerical choices. The use of "right answer not given" as a possible response increased the difficulty of the test to a slight (but statistically significant) extent. No evidence was found indicating that any combination of 10, 12 or 14 minute time-limits for the computation subtest and 30, 35 or 40 minute time-limits for the reasoning subtest was better than the original operational combination of 12 and 35 minutes. The insensitivity of the Arithmetic Test to reductions of about seven minutes consideration should be given to reducing the time limits, providing that later research shows this to be possible with no reduction in validity.

Naval Personnel Research Field Activity, Washington, D. C.
VALIDITY OF NON-COGNITIVE TESTS AT NUCLEAR POWER SCHOOL (SUBMARINE) by David Kipnis and Albert S. Glickman. May 59, 16p. 1 ref. BuPers Technical Bulletin 59-6.
Order from LC mi$2.40, ph$3.30 PB 143 251

The results obtained with the experimental tests indicate that they may be valuable supplements to current cognitive predictors of NP school performance. If confirmed by additional research already in progress, two potential benefits are in prospect: (a) it will be possible to increase the accuracy of selection, improve quality of manpower input, and increase the level of performance in programs such as these; or (b) it will be possible to increase the pool of men capable of performaing satisfactorily while maintaining the standards that are considered satisfactory at present.

Navy Experimental Diving Unit, Naval [Weapons Plant] Washington, D. C.
MECHANICAL RESPIRATOR TECHNIQUES IN THE EVALUATION OF SCUBA, by G. M. Janney and W. F. Searle, Jr. 30 June 58, 46p. Research rept. 6-58.
Order from LC mi$3.30, ph$7.80 PB 139 171

A "mechanical respirator" has been and is currently used in research and evaluation projects at the Experimental Diving Unit to determine breathing resistance in breathing apparatus. The equipment and the procedure followed when using it are described. The accuracy and the usefulness of the data obtained through the use of the mechanical respirator are discussed.

Personnel Lab., Wright Air Development Center, Lackland AFB, Tex.
FEASIBILITY OF A METHOD FOR ESTIMATING SHORT-TERM AND LONG-TERM EFFECTS OF POLICY DECISIONS ON THE AIRMAN PERSONNEL SYSTEM, by John W. Merck and Frank B. Ford. June 59, 21p. 1 ref. WADC-TR-59-38; AD-217 079.
Order from LC mi$2.70, ph$4.80 PB 143 689

This report describes and indicates the utility of a model which simulates the flow of airmen through the Air Force personnel system under a given set of policies. This model makes it possible to estimate, with as much accuracy as is available in the input information, the effects of that set of policies at future points in time. These effects may be gauged in terms of the future distribution of grade levels, career fields, or other pertinent information which may be built into the model.

Personnel Lab., Wright Air Development Center, Lackland AFB, Tex.
OCCUPATIONAL CLASSIFICATION IN SOME MAJOR GOVERNMENT AGENCIES, by Joseph E. Morsh and Forrest R. Ratliff. WADC-TN-59-37; AD-212 540.
Order from LC mi$4.80, ph$13.80 PB 143 690

On the basis of information obtained during personal visits and conferences, current practices in occupational classification in some major military and civilian agencies of the Federal Government are reported. The following agencies are included: Department of the Air Force, Bureau of Naval Personnel in the Department of the Navy, the Adjutant General's Office in the Department of the Army, the Bureau of Labor Statistics and the Bureau of Employment Security in the Department of Labor, the Census Bureau in the Department of Commerce, and the United States Civil Service Commission. The prime purpose of the survey was to generate hypotheses for the furtherance of occupational classification research in the Air Force. In a concluding section of the report the present state-of-the-art of occupational classification is discussed and research implications are suggested.

Personnel Research and Development Corp., Cleveland, Ohio.
THE INFLUENCE OF RATING SCALE CONSTRUCTION UPON THE CHARACTERISTICS OF RATINGS RENDERED. Rept. on Contract Nonr-2221(00). Oct 58, 136p. 5 refs.
Order from LC mi$6.90, ph$21.30 PB 143 703

Four rating scale formats were used by the first and second line supervisors of four groups of clerical workers. The formats varied from unstructured to highly structured. The format incorporating trait titles and behavioral descriptions of scale steps demonstrated marked superiority over both more and less structured formats. This format demonstrated higher interrater reliability, less halo and less leniency than did the other formats. Variability was approximately equal for all formats. The study will be reported in four parts. Part I will report respective reliability, leniency, halo, and variability. Part II will be concerned with the characteristics of the eight scales as

they are influenced by the several formats. The comparisons of these self ratings with ratings made by superiors will be presented in Part III. To verify the results of the basic study, truncated versions of Formats I and III were used in two clerical and one manufacturing situation in industrial organizations. These results will be presented in Part IV.

School of Aviation Medicine, Randolph AFB, Tex.
THE PRESENT STATUS OF PHYSICAL FITNESS IN THE AIR FORCE, by Bruno Balke and Ray W. Ware. May 59, 10p. 8 refs. Rept. 59-67.
Order from LC mi$1.80, ph$1.80 PB 143 374

Work capacity, a sensitive and realistic measure of "physical fitness," was determined on more than 500 military and civilian Air Force personnel for the purpose of collecting material for the standardization of physical performance capacity. A treadmill test permitted an evaluation of results in physical as well as in physiologic terms. On the basis of results, physiologic considerations, and observations of men at various stages of physical training, an arbitrary rating scale of work capacity is suggested. According to this pilot study 42 percent of the test population had to be rated as "poor" and 40 percent as "fair." Only 18 percent could be considered as having a "good" or better physical condition. Sedentary living habits, more than aging or other factors, were apparently the main antagonists of good physical fitness.

Washington U., Seattle.
DIFFERENTIAL PREDICTION OF NAVAL SCIENCE AND APTITUDE GRADES AT THE UNIVERSITY OF WASHINGTON FROM BATTERIES OF FOURTEEN AND OF THREE VARIABLES, by Thomas D. F. Langen. Rept. on Predictor Selection Techniques, Contract Nonr-477(08). Oct 58, 95p. 41 refs.
Order from LC mi$5.40, ph$15.30 PB 143 714

The Washington Pre-College Differential Grade Prediction Battery is an effective instrument for the selection of Naval ROTC students for either the subsidized or the non-subsidized programs. It is slightly superior to either of the instruments now used by the Navy Department in selecting such students. The results of this exploratory study are such as to warrant further study on a larger scale.

Psychology

Aero Medical Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
TRANSFER OF TRACKING PERFORMANCE AS A FUNCTION OF A DELAY BETWEEN THE CONTROL AND THE DISPLAY, by Marvin Levine. Rept. on Learning and Transfer in Reference to Training Aid Design, Contract AF 18(600)50. Nov 53, 33p. 13 refs. WADC Technical rept. 53-237.
Order from LC mi$3.00, ph$6.30 PB 138 912

Using a one-dimensional, compensatory tracking task, an investigation was made into the way tracking performance transfers as a function of changes in an exponential delay inserted between the operator's control and his display. The research was divided into two studies. The first investigated performance on a transfer task containing a 3.000 second exponential delay following training with delays of either .015, .150, .900, 2.100, or 3.000 seconds in the system. The second investigated performance on a transfer task containing a delay of .015 seconds following training with delays of either .015, .900, or 3.000 seconds in the system. The results show that (a) when operators transfer to the longest delay, training with any of the shorter delays is equally efficient; (b) when operators transfer to the shortest delay, training efficiency decreases with decreasing similarity of the training and transfer situations.

Applied Mathematics and Statistics Lab., Stanford U., Calif.
A LINEAR LEARNING MODEL FOR A CONTINUUM OF RESPONSES, by Patrick Suppes. Technical rept. no. 19 on Contract Nonr-255(17). 18 Oct 58, 29p.
Order from LC mi$2.70, ph$4.80 PB 143 018

The aim of the present investigation is to formulate and analyze a linear model for simple learning with a continuum of responses. The analogous model for a finite number of responses has been extensively studied both experimentally and mathematically.

Arizona State Coll., Tempe.
FIRST-ORDER CONDITIONING OF MEANING AND THE PARALLEL CONDITIONING OF A GSR, by Arthur W. Staats, Carolyn K. Staats, and Hugh L. Crawford. Technical rept. no. 6 on Psychological Processes in Language Communication, Contract Nonr-2305(00). Sep 58, 9p. 13 refs.
Order from LC mi$1.80, ph$1.80 PB 143 696

A GSR was conditioned to the word LARGE, as it was presented in a list of words to the Ss, using shock and noise as UCS. The word BIG was also presented at the end of the list to test for generalization of the conditioned GSR. Generalization did not occur. Subsequent to this conditioning procedure, the evaluative meaning of LARGE, and its synonym BIG were measured using an appropriate semantic differential scale. Negative evaluative meaning had been conditioned to LARGE. This meaning did not generalize to BIG. Thus, the same procedure which conditioned a GSR to a word also conditioned negative evaluative meaning to the word--but in neither case did the conditioned response generalize to a synonym word. It was found, in addition, that the intensity of the conditioned GSR was significantly correlated with the intensity of the conditioned meaning response. The results support the theory that word meaning consists of responses which are classically conditioned to a word through systematically pairing it with certain aspects of the environment. Alternative interpretations of the relationship of the GSR and meaning response were discussed. It was pointed out that further studies utilizing the methodology of the present experiment might shed light on the unanswered questions raised by the discussion. In general it was felt that the present procedure would be useful in establishing the principles of the learning of word meaning.

Arizona State Coll., Tempe.
MEANING AND (M): CORRELATED BUT SEPARATE, by Arthur W. Staats and Carolyn K. Staats. Technical rept. no. 7 on Psychological Processes in Language Communication, Contract Nonr-2305(00). Oct 58, 12p. 17 refs.
Order from LC mi$2.40, ph$3.30 PB 143 391

Two approaches to meaning were summarized and contrasted. Word meaning may be considered to be the verbal responses made to the word, or word meaning may be a conditioned response, part of the response elicited by the object denoted by the word. The present paper described the latter as meaning and distinguished word meaning from a word's verbal associates. The correlation between intensity of meaning and verbal associate measures which has been reported was seen to be a result of the artifact that the same operation strengthens both: the more often a word is paired with its associates the stronger the connections between them. In addition, the meaning of the associates is conditioned to the word. This view was supported by showing that the associates of a word have the same meaning as the word. The two approaches to meaning were discussed further and it was concluded that words could not gain meaning through verbal associations per se. Originally, it is through pairing words with systematic aspects of the environment that their meaning is gained. The meaning acquired in this process may later be conditioned to other words.

Army Ordnance Human Engineering Lab., Aberdeen Proving Ground, Md.
THE MOTIVATIONAL EFFECTS OF REST PERIODS ON PERFORMANCE, by Samuel A. Hicks. Aug 59, 21p. Technical memo. no. 8-59.
Order from LC mi$2.70, ph$4.80 PB 143 532

This study investigated the effects of different rest schedules on the performance of a heavy rotary task. The schedules used were: (1) Fixed Interval (FI) - rest after a given amount of time (2) Fixed Ratio (FR) - rest after a given number or responses. Forty enlisted men were used as subjects for this experiment. The results indicate that for the type of task under consideration here the FR schedule elicits greater total output than does the FI schedule. There are indications that this effect may be a direct result of the work load or physical strength of the operator. Variables requiring further investigation are cited in this report.

Colorado U., Boulder.
SOCIAL AND PERSONALITY FACTORS IN ATTITUDE CHANGE, by O. J. Harvey. Annual technical rept. on Contract Nonr-2149(02). Nov 58, 14p.
Order from LC mi$2.40, ph$3.30 PB 143 462

Connecticut Coll., New London.
CONFORMING BEHAVIOR AND PERSONALITY VARIABLES, by Mortimer H. Applezweig and George Moeller. Technical rept. no. 8 on Contract Nonr-996(02). Apr 58, 25p. 25 refs.
Order from LC mi$2.70, ph$4.80 PB 138 603

Conforming behavior of 41 college freshman women, as measured in an Asch situation, was compared with 38 scales of the Edwards Personal Preference Schedule, the Gough California Psychological Inventory, and the Gordon Personal Profile. It was found that only the Abasement scale of the Edwards, and possibly the Sociability scale of the Gordon were able to generate significant relationships with a kind of behavior which should have been predictable from some 12 to perhaps 27 of the 38 measures used. Excepting the five scales of Gough's 18, on the basis of questionable comparability of samples, a total of 33 measures were correlated with conformity behavior. Only two were found to have construct validity for this type of social conformity criterion.

Educational Testing Service, Princeton, N. J.
EMPIRICAL TRIAL OF METHODS FOR ESTIMATING THE DISTRIBUTION OF TRUE SCORES, by Frederic M. Lord. Rept. on Contract Nonr-2214(00). Oct 58, 16p. 2 refs.
Order from LC mi$2.40, ph$3.30 PB 143 698

For each of two groups of examinees, the third and fourth moments of the distribution of true scores on a French achievement test are estimated by two different methods. One set of estimates results directly from the classical assumptions that the errors of measurement are distributed normally and independently of true score. The other set of estimates is obtained under the "item-sampling" model. A check is obtained on the item-sampling model by (a) applying it to the two groups separately, (b) applying it to the same groups combined. Pearson type-I curves are fitted to the estimated moments and the resulting estimated frequency distributions of true scores are drawn. The two methods of estimation are found to give almost the same results for the four-semester group, but somewhat different results for the eight-semester group. Theoretical considerations show that the two methods must give nearly the same results when a test is highly reliable. A manageable formula displaying the relation between the two methods of estimation in the case of the third true-score moment is presented.

Educational Testing Service, Princeton, N. J.
RESPONSE SET AS A MEASURE OF PERSONALITY, by Norman Frederiksen and Samuel Messick. Rept. on Contract Nonr-694(00). Feb 58, 34p. 36 refs. AD-156 771.
Order from LC mi$3.00, ph$6.30 PB 138 339

The present research was primarily oriented toward the use of response sets to measure stylistic consistencies revealed in test-taking behavior. The study was concerned with whether or not set scores could be obtained independently of content and with at least potentially useful reliability. Also investigated were the extent to which set and content scores obtained from different tests measure the same or different characteristics, and the extent to which set scores change with experimental conditions designed to modify set. The major findings were: (1) Reliable set scores can be obtained. (2) The three "criticalness" set scores were found to be substantially intercorrelated. (3) "Critical" instructions altered mean

criticalness set scores in the expected direction to an extent that is significant for one test, nearly significant for another test, and non-significant for the third test. (4) Although uncritical tendencies are correlated with acquiescence, the two response sets are not identical. (5) Content scores from the report-writing tests were found to be intercorrelated with each other, but low correlations were obtained between content and set scores. (6) Content scores were related to Mathematics Aptitude, Reasoning, and Vocabulary, but "criticalness' set was generally unrelated to ability. (7) Patterns of correlations with personality variables suggest the possibility of using different response sets to measure various personality consistencies.

Iowa State U. [Iowa City].
SENTENCE COMPLETIONS E: SUSCEPTIBILITY TO "SCORE FAKING", by Arthur L. Benton, Harold P. Beechtoldt, and Joan D. Kemble. Rept. on Research on Aptitude-for-Service Tests for Enlisted Personnel, Contract Nonr-311(11). 15 Apr 58, 5p. 1 ref.
Order from LC mi$1.80, ph$1.80 PB 138 841

Sentence Completions E consists of 20 incomplete sentences, each with three possible endings which the subject is required to rank in terms of the one that best describes how he thinks or feels, the one that least well describes how he thinks or feels, and the one that occupies an intermediate position in these respects. There are six possible response patterns associated with each ranked item. For each item there is one response pattern which was found on two independent samples both to be modal for enlisted men with records of successful naval service and also to discriminate significantly between these men and groups of men with records of unsuccessful naval service, as defined by discharges for reasons of personal inadequacy or delinquent conduct. The test is scored in terms of the number of these discriminating response patterns which appear in the total performance.

Louisiana State U., Baton Rouge.
GROUP EFFECTIVENESS, COERCION, CHANGE AND COALESCENCE AMONG DELINQUENTS COMPARED TO NON-DELINQUENTS, by Howard A. Bryant, D. A. Dobbins, and Bernard M. Bass. Technical rept. no. 15 on Behavior in Groups, Contract N7onr-356(09). Oct 58, 16p. 14 refs.
Order from LC mi$2.40, ph$3.30 PB 143 392

The hypothesis was tested that institutionalized delinquents are more susceptible to peer group influence than non-delinquent boys matched in intelligence and age. Three groups of 5 delinquents at each of 4 age levels: 14, 15, 16 and 17, were contrasted with 12 corresponding groups of boys from a small town public high school. Each member of each group privately ranked 5 cities according to their estimated size. A discussion followed in order to obtain a group decision. Then a final private decision was recorded by each member. Rank order correlations within and between members were the measures of agreement and accuracy used to test the hypothesis. Although non-delinquents were significantly more in agreement before and after discussion, delinquents increased more in agreement as a consequence of discussion, although not significantly so. The hypothesis generally was supported that delinquents are more sensitive to the effects of interaction with their peers; they coalesce more (but not significantly according to parametric tests); they shift their opinions significantly more; they profit more in accuracy (but not significantly) and they are more coerced by their peers accepting the opinions of others more publicly than privately at all age levels examined. It would appear that delinquents, even more than non-delinquents, are likely to respond to suggestion to change, if the suggestions come from peers during discussion and if group decisions are permitted. The results are consistent with observations about the significance of the gang to the delinquent and suggest that changing attitudes and reeducating delinquents will be facilitated by judicious use of their own peer groups.

Louisiana State U., Baton Rouge
TEST OF A PROPOSED THEORY OF LEADERSHIP, by Bernard M. Bass. Annual rept. no. 4 on Behavior in Groups, Contract N7onr-356(09). 15 Nov 58, 6p. 12 refs.
Order from LC mi$1.80, ph$1.80 PB 143 422

Analyses of data based on an original experiment with 255 subjects have been finished. Attention has been focused on testing specific hypotheses drawn from a theory of leadership and group behavior. The theory itself, with a review of the literature, has been completed. New experiments and methodological examinations carried out. (See also PB 137 057)

Naval Retraining Command, San Diego, Calif.
INTERPERSONAL VARIABLES RELATED TO RECIDIVISM IN MILITARY DELINQUENCY, by Virginia Ives, Marguerite Q. Grant, and Kelley B. Ballard. Technical rept. no. 8 on Rehabilitation Research, Contract Nonr-1535(00). 15 Dec 57, 15p. 10 refs.
Order from LC mi$2.40, ph$3.30 PB 138 649

Ninety-one men confined for military disciplinary offenses were interviewed just prior to their restoration to regular duty. The interviews were tape-recorded and the recordings were rated twice independently on 430 rating items. Each of these items was correlated with a dichotomous success-failure criterion based upon a report of each man's duty status six months after restoration. Forty-seven items proved to be significantly related to restoration behavior. The majority of these items appear to be related to aspects of the man's level of interpersonal maturity. The present study is seen as preliminary and will be followed by a more detailed study on a larger sample.

Minnesota U., Minneapolis.
MISCELLANEOUS STUDIES IN WORD ASSOCIATION, by James J. Jenkins and Wallace A. Russell. Technical rept. no. 24 on The Role of Language in Behavior, Contract N8onr-662(16). [1958] 14p. 7 refs.
Order from LC mi$2.40, ph$3.30 PB 143 393

Personnel Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
SOME STATISTICAL METHODS FOR DETECTION OF NONSTANDARD TEST ADMINISTRATION, by Leland D. Brokaw. Jan 59, 36p. 11 refs. WADC-TN-59-34; AD-210 475.
Order from LC mi$3.00, ph$6.30 PB 143 540

This paper reports the application of statistical techniques to the detection of fallacious values in test score distributions. Fallacious scores may appear from several sources, including cheating, improper procedures of test administration, or errors of scoring. Three techniques were chosen which are peculiarly appropriate to the task of detection of abnormalities of score distributions occasioned by the shifting of a group of scores from its proper place within the distribution: the sign test, the Kolmogorov-Smirnov test, and the significance of the difference between standard deviations. The techniques were applied to eight 100-case samples of basic airmen who had been tested and retested at Lackland Air Force Base on alternate forms of the Armed Forces Qualification Test. A control sample was selected, and the test scores from the other seven samples were altered to replicate conditions encountered operationally. The sign test proved more efficient than the other techniques, identifying six of the seven samples containing fallacious data. The other two techniques each identified four of the seven samples, but not the same four samples.

Psychological Labs., Carnegie Inst. of Tech., Pittsburgh, Pa.
VARIABLES UNDERLYING SOCIOMETRIC STATUS. III. CONFORMITY BEHAVIOR: A PSYCHOLOGICAL REINTERPRETATION, by E. P. Hollander. Technical rept. on Contract Nonr-1849(00). Oct 58, 17p. 15 refs.
Order from LC mi$2.40, ph$3.30 PB 143 705

The central thesis developed is essentially as follows: an individual functions within a social field largely in terms of his perception of the "group expectancies" regarding his behavior. Depending upon his motivational and perceptual states, as they relate to certain features of the social field, he will be more or less given to behavior in keeping with these expectancies. Expectancies are not static but rather depend upon the outcome of past interaction between the individual and relevant others. A core element then is the historical or time-linked effects of interaction in determining the countervailing perceptions of the individual and these others.

Psychological Labs., Carnegie Inst. of Tech. Pittsburgh, Pa.
VARIABLES UNDERLYING SOCIOMETRIC STATUS. IV. SOME FURTHER FINDINGS ON LEADERSHIP, FOLLOWERSHIP AND FRIENDSHIP, by E. P. Hollander. Technical rept. on Contract Nonr-1849(00). Nov 58, 12p. 5 refs.
Order from LC mi$2.40, ph$3.30 PB 143 460

Using poor nomination data secured from graduating medical students at the University of Pittsburgh, an analysis was undertaken paralleling previous the analysis by Hollander and Webb of nominations on leadership, followership, and friendship. Corroboration of these earlier findings was obtained. Some implications were seen regarding the differential evaluative base underlying these nominations.

Psychological Research Association, Inc., Arlington, Va.
A REPORT ON RESEARCH CONCERNING A METHOD FOR OPTIMIZING THE EFFICIENCY OF TRAINING PROGRAMS, by James F. Parker, Jr. Annual rept. on Contract Nonr-2489(00). Dec 58, 14p. 1 ref.
Order from LC mi$2.40, ph$3.30 PB 143 617

This report is intended to describe the basic nature of the program and to indicate results which might be forthcoming. It is not designed as a definitive report on results obtained during a particular phase of the project.

Psychologisch Laboratorium van de Universteit te Nijmegen (Netherlands).
THE PROCESS OF ASSIMILATION WITH STRANGERS TO A NEW LIVING AND WORKING ENVIRONMENT. Annual Technical rept. no. 1, 1 Feb 58-1 Mar 59, on Contract DA 91-508-EUC-285. Mar 59, 71p. 1 ref. AD-213 233.
Order from LC mi$4.50, ph$12.30 PB 143 366

The investigation is carried in two separate parts (I and II). Investigation I refers to the process of assimilation with unmarried Italians, natives of Sardinia, who are employed as miners in the Dutch National Coalmines. In this investigation 3 groups of 20 Italians are interviewed. Investigation II refers to the process of assimilation with 40 Indian-Dutch families who were expelled from their native country and settled in the Netherlands in the hope of building up a new existence. The present Report can only give an account of the results of phase 1, investigation II.

Vanderbilt U., Nashville, Tenn.
AUTHORITARIANISM AND LEADER ACCEPTANCE, by Edward P. Crockett (Master's thesis). Technical rept. no. 5 on Contract Nonr-2149(02). Oct 58, 22p. 29 refs.
Order from LC mi$2.70, ph$4.80 PB 143 708

The relationship between authoritarianism and acceptance of formal leadership in established organizations was examined from the following standpoints: (a) Acceptance of formal leadership as a function of member authoritarianism. (b) Leader acceptance as a function of leader authoritarianism. (c) Leader acceptance as related to the degree of correspondence between authoritarianism in the leader's and follower's personalities.

Vanderbilt U., Nashville, Tenn.
EXTRAPUNITIVENESS AND AUTHORITARIANISM: CHANGES IN ATTITUDINAL CORRELATES AS A RESULT OF FRUSTRATION, by Jack M. Wright. Technical rept. no. 7 on Contract Nonr-2149(02). [1959] 26p. 17 refs.
Order from LC mi$2.70, ph$4.80 PB 143 710

The results of relating changes in professed attitudes of individuals (as a result of frustration) to extrapunitiveness, as measured by the P-F Study, and authoritarianism, as measured by the California F-scale, and relating these changes to one another, and summarized below. When frustrated by an authority figure, authoritarians increased (in a positive direction) their evaluations of peer group, authority figures, people in general, and self, more than did nonauthoritarians. Evidence was also found to the effect that authoritarians are more easily frustrated than are nonauthoritarians. Through the technique of partial correlation, evidence was found of a tendency on the part of authoritarians to suppress aggression toward a frustrating authority, necessitating an increased positive evaluation of self and others as a form of compensation. Lack of any significant correlations between the P-F Study and changes in the variables, or with the F-scale, is discussed as being the result of lack of consideration on the part of this instrument of certain factors of a social nature which aid in determining reactions to frustration.

Vanderbilt U., Nashville, Tenn.
RECIPROCAL INFLUENCE OF GROUP AND THREE TYPES OF LEADERS IN AN INSTRUCTED SITUATION, by O. J. Harvey. Technical rept. no. 4 on Contract Nonr-2149(02). Oct 58, 21p.
Order from LC mi$2.70, ph$4.80 PB 143 706

The small groups studied were squads from an Army airborne division. From these, three different types of leaders were sociometrically determined. The formal leader was the official squad leader but not preferred as leader by the men. The informal leader was preferred by the men to be the squad leader but was not the official leader. The formal-informal leader was both the official squad leader and preferred by the men to be. The total number of subjects was 354, 285 experimental and 69 control. In comparison to the control groups, the leaders in all conditions conformed markedly to the judgments of the members despite the large differences in the leader and members' stimuli. Even in those conditions where leaders did depart from group judgments in their own evaluations, the influence on the group was almost nil. Significant differences occurred among the different leaders in the extent to which they were influenced by group judgments. Most conforming to the evaluations of other members of the group was the unpopular formal leader in the absolute, or more uncertain, condition. Possible implications of this for military leadership were indicated. Authoritarianism, group satisfaction and solidarity, and informal status in the group did not relate to influencibility. However, members' popularity in the squad did correlate significantly to their influence by the leader in the informal-absolute and informal-gradual conditions, the conditions in which the leader was the one preferred by the men to be their leader.

Vanderbilt U., Nashville, Tenn.
STATUS AND CONFORMITY TO PRESSURES OF INFORMAL GROUPS, by O. J. Harvey and Conrad Consalvi. Technical rept. no. 6 on Contract Nonr-2149(02). Oct 58, 16p. 10 refs.
Order from LC mi$2.40, ph$3.30 PB 143 709

This study was concerned primarily with the differential conformity of the leader, second and lowest ranking member to pressures in the informal group. The informal groups were 27 cliques sociometrically selected from a training school for delinquent boys. The main finding of the study was that the second status member, the one only one step removed from the top, was significantly more conforming to judgments of the other members than was either the leader or lowest status man. The leader was least conforming but, due perhaps to smallness of the sample, not reliably less than the lowest status person.

Walter Reed Army Inst. of Research, Washington, D. C.
ASPECTS OF GROUP BEHAVIOR UNDER ATOMIC ATTACK, by Donald N. Michael. Aug 56, 16p. Management of Mass Casualties Publication no. 582.
Order from LC mi$2.40, ph$3.30 PB 143 753

A lecture presented to the students of the course "Medical Care of Atomic Casualties" at Walter Reed Army Medical Center.

[Washington U., St. Louis, Mo. School of Medicine]
THE EFFECTS OF MASSED AND SPACED ELECTROCONVULSIVE SHOCK ON CONFLICT BEHAVIOR IN THE MALE ALBINO RAT, by G. J. Williams. Status rept. for June-31 Dec 57 on Contract Nonr-816(06). [1957] 7p. AD-203 078.
Order from LC mi$1.80, ph$1.80 PB 138 205

See also PB 140 182

Washington U., Seattle.
THE GENERAL AND PRIMARY FACTORS IN STUDENT EVALUATION OF TEACHING ABILITY, by Thomas F. Hodgson. Rept. on Contract Nonr-477(08) and Public Health Research Grant M-743(C3). Oct 58, 101p. 15 refs.
Order from LC mi$5.70, ph$16.80 PB 143 713

The following points are covered:
Methodology
Studies of the general factor model
Definition of symbols
Simple structure
Orthogonal rotation
Oblique rotation
Extended vector analysis
Final rotated matrix
Analytic solutions
Oblique transformation matrix H and primary factors
Correlations among primary factors
The general factor
Augmented factor space, followed by
Discussion

BIOLOGICAL SCIENCES

Arctic Aeromedical Lab., Ladd AFB, Alaska.
A SIMPLIFIED APPARATUS FOR THE PREPARATION

OF TISSUE SLICES, by John P. Hannon. May 59, 11p. 7 refs. Technical rept. 57-42; AD-220 679.
Order from LC mi$2.40, ph$3.30 PB 143 530

The construction and use of a simple tissue slicing apparatus is described. It offers the following advantages: it can be easily constructed from readily available and inexpensive materials; it is easily adapted to the cutting of different thicknesses of slices; it is simple to learn to use; and it is especially useful where small amounts of tissue are available for slicing.

[Harvard U., Cambridge, Mass.]
TETANUS TOXOID PRODUCTION, by Monroe D. Eaton, Clarke T. Gray, and Pauline Miller. Final rept. for May 54-31 Oct 58 on Contracts N5ori-07655 and Nonr-1866(21). [1958] 12p. 6 refs.
Order from LC mi$2.40, ph$3.30 PB 143 394

A summary of observations

Oak Ridge National Lab., Tenn.
GENETIC DIFFERENCES IN HEMOGLOBIN AS MARKERS FOR BONE MARROW TRANSPLANTATION IN MICE, by Raymond A. Popp, G. E. Cosgrove, Jr., and R. D. Owen. Mar 59, 4p. 18 refs. AFSAM rept. 59-44.
Order from LC mi$1.80, ph$1.80 PB 143 368

Both hemoglobin type and red cell serotype seem to be autonomously controlled by the genotype of the nucleated cell from which the erythrocyte is derived. Thus, genetic differences in hemoglobin can be used as markers for bone marrow transplantation in irradiated mice. Hemoglobin typing may be particularly useful where the H-2 markers cannot be used.

Anatomy and Physiology

Aero Medical Lab., Wright Air Development Center Wright-Patterson AFB, Ohio.
THE EFFECTS OF POSITIVE ACCELERATION ON THE RELATION BETWEEN ILLUMINATION AND INSTRUMENT READING, by William J. White and Mitchell B. Riley. Nov 58, 13p. 7 refs. WADC Technical rept. 58-332; AD-206 663.
Order from LC mi$2.40, ph$3.30 PB 143 544

The following basic findings resulted from an analysis of the data from this experiment: (1) At the higher levels of instrument illumination, increasing acceleration and decreasing luminance produce relatively small increase in reading errors. (2) At marginal levels of illumination, acceleration and luminance interact to produce a relatively large increase in error. (3) Intensity of illumination can compensate for the decline in visual performance at stress levels above 1 g.

Aero Medical Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
SHORT TIME HUMAN TOLERANCE TO SINUSOIDAL VIBRATIONS, by Gerd H. Ziegenruecker and Edward B. Magid. Rept. on Acoustic Energy Control. July 59, 18p. 15 refs. WADC Technical rept. 59-391.
Order from OTS $0.50 PB 161 083

Short time human tolerance criteria for sinusoidal vibration from 1 to 15 cps were determined using 10 healthy male subjects ranging in age from 23 to 34 years. At each frequency, the amplitude was increased at a constant rate from zero to the point where the subject stopped the run because he thought that further increase might cause actual bodily harm. The lower levels of tolerance were found to be between 1 and 2 g at 3 - 4 cps and at 7 - 8 cps. The highest tolerance level of 7 - 8 g was found at 15 cps. Subjective tolerance limits were found to be caused by one or more of seven specific sensations or symptoms. Physiological observations during vibration exposure were also made.

Air Force Missile Development Center, Holloman AFB, N. Mex.
PHYSIOLOGICAL EFFECTS OF INERT GASES, by S. F. Cook and H. A. Leon (U. of California). Rept. on Contract AF 29(600)1313. June 59, 40p. 42 refs. AFMDC-TR-59-26; AD-216 891.
Order from LC mi$3.00, ph$6.30 PB 143 657

This report presents the results of investigations on the use of helium and other inert gases in sealed cabin environments. Included in the report is an extensive bibliography of previous work in this field as well as results obtained from experiments conducted under the above contract. This Technical Report is prepared from progress reports and the final report submitted by Professor Cook during and upon completion of the studies.

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
THE EFFECT OF TEMPERATURE ON TOLERANCE TO POSITIVE ACCELERATION, by Benjamin F. Burgess, Jr. Rept. no. 16 on Proj. NM 19 01 12.1; 26 May 59, 13p. 3 refs. NADC-MA-5905.
Order from LC mi$2.40, ph$3.30 PB 143 738

With the advent of space flight, the problems associated with the physiological effects of extreme temperatures may become a critical factor relating to pilot performance under conditions of high acceleration. In order to determine the effects of high environmental temperatures on G tolerance, six trained centrifuge subjects were exposed to positive acceleration in the heated gondola of the Johnsville centrifuge. Seven thermocouples were located at strategic places over the body surface in order to obtain an accurate recording of skin temperature. Although humidity was not controlled, it was recorded during all centrifuge runs. The environmental temperatures studied ranged from 75°F to 160°F where a decrement in G tolerance of 1 G has been obtained at the upper temperature range.

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
A STUDY OF THE EFFECTS OF POSITIVE ACCEL-

ERATION UPON ERYTHROCYTE HYDRATION IN HUMAN SUBJECTS, by Richard L. Fenichel, and George H. Kydd. 12 May 59, 15p. 9 refs. Rept. no. 1 on Proj. NM 19 02 12. 2; NADC-MA-5904.
Order from LC mi$2. 40, ph$3. 30 PB 143 250

The seven subjects employed in this study were exposed to a standardized pattern of positive G. Each subject experienced positive accelerations, which were begun at 1. 5 G and were increased at half G increments, with 5-minute rest periods between runs, until the subject lost peripheral lights. Table I shows the acceleration schedule that was employed. Blood samples were drawn before the acceleration series was begun, after the third run, and after the run in which the subject lost peripheral lights.

California Agricultural Experiment Station, Davis.
PHYSIOLOGICAL RESPONSES TO ARTIFICIAL ALTERATIONS IN WEIGHT, by C. F. Kelly, A. H. Smith, and C. M. Winget. Annual progress rept. no. 2, 15 Apr-15 Dec 57, on Contract Nonr-2211(01). 15 Dec 57, 30p.
Order from LC mi$2. 70, ph$4. 80 PB 138 628

These experiments indicate that chickens can survive accelerative forces up to 4 G_S, though with considerable mortality and growth repression. Up to 2. 5 G_S, however, this treatment appears to have little effect (i. e., normal growth and negligible mortality). No definite syndrome has been established for birds dying while exposed to an accelerative force. Birds grown under an accelerative force show some anatomic changes. Physiological changes observed have been quite variable, and sometimes contradictory between different trials. It is assumed that these differences arise from other factors (age of animals, temperature acceleration schedule, etc.) and can be rationalized with the accumulation of more data. Consistent changes have been observed in heart rate (increased) and respiratory frequency (decreased). On return to normal gravity, the physiological differences between centrifuged birds and their controls disappear in about 3 weeks. In some cases there is a period of over compensation (viz.: respiratory frequency, which is decreased in centrifugation, becomes faster than the controls during the first two weeks at normal gravity.) Some progress has been made on the development of a high-G_S strain.

California Inst. of Tech. [Pasadena].
FACTORS STIMULATING PRODUCTION OF HEMOGLOBIN AND RED CELLS. Annual rept. for year ending 31 Dec 57 on Contract Nonr-220(09). 6 Dec 57, 2p.
Order from LC mi$1. 80, ph$1. 80 PB 138 650

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
PERCEPTRON SIMULATION EXPERIMENTS, by Frank Rosenblatt. Rept. on Contract Nonr-2381(00). June 59, 37p. 8 refs. Rept. VG-1196-G-3.
Order from OTS $1. 00 PB 161 065

A number of papers and reports have been published describing the theory of a new brain model called the perceptron. The perceptron is a minimally constrained "nerve net" consisting of logically simplified neural elements, which has been shown to be capable of learning to discriminate and recognize perceptual patterns (References 5, 6, 7, 8). This paper is concerned with a report of digital simulation experiments which have been carried out on the perceptron, using the IBM 704 computer at the Cornell Aeronautical Laboratory. These experiments are intended to demonstrate the performance of particular systems in typical environmental situations, free from any approximations which have been used in the previously published mathematical analyses. In the simulation programs, the action of every cell and every connection in the network is represented in detail, and visual stimuli are represented by dot patterns corresponding to illuminated points in a retinal mosaic.

Florida U. Coll. of Medicine, Gainesville.
ESTIMATION OF THYROXINE OUTPUT BY THE THYROID GLANDS OF NORMAL AND ADRENALECTOMIZED RATS BY MEANS OF A SIMPLE COOLING TEST, by Melvin J. Fregly. May 59, 8p. 17 refs. AFSAM rept. 59-28.
Order from LC mi$1. 80, ph$1. 80 PB 143 383

Adrenalectomy, administration of propylthiouracil, or a combination of these two treatments increased significantly the rate of cooling of rats restrained and subjected to air at 5° C. Propylthiouracil administration increased rate of cooling 55 percent above that of untreated control rats while adrenalectomy increased rate of cooling 84 percent. The combination of these two treatments increased rate of cooling 99 percent. Dead rats cooled 201 percent faster than control rats. Administration of graded doses of thyroxine to both adrenalectomized-PTU-treated rats and to normal-PTU- treated rats indicated that 1. 9 and 4. 4 gamma per day of thyroxine, respectively, were required to return rate of cooling to that of comparable controls. These doses are, therefore, the best estimates of thyroxine outputs by thyroids of these animals. The results suggest that adrenalectomy is accompanied by diminished thyroid function. This fact makes difficult any evaluation of the relative roles of thyroid gland and adrenal glands in the maintenance of body temperature of rats exposed to cold.

Institute of Andean Biology, Lima (Peru).
CREATININE EXCRETION AND BODY COMPOSITION AT HIGH ALTITUDES, by Emilio Picón-Reátegui. Feb 59, 9p. 16 refs. AFSAM rept. 58-98.
Order from LC mi$1.80, ph$1.80 PB 143 749

To test the hypothesis that urinary creatinine can be used in the prediction of body compartments we have measured urinary creatinine excretion and related these data to body mass and to body compartments on the same subjects.

Johns Hopkins Hospital, Baltimore, Md.
A BUBBLE METHOD FOR ESTIMATION OF P_{CO_2} AND P_{O_2} IN WHOLE BLOOD [AND] AN ANALYSIS OF ERRORS IN THE BUBBLE METHOD FOR ESTI-

MATION OF P_{CO_2} AND P_{O_2} IN WHOLE BLOOD, by Richard L. Riley, Richard H. Shepard and others. Nov 58, 21p. 22 refs. AFSAM repts. 58-(135, 136).
Order from LC mi$2.70, ph$4.80 PB 143 385

A detailed description is presented of a bubble-equilibration method for determination of carbon dioxide and oxygen tensions in blood. This modification represents an attempt to adopt the best features of previously published methods with special emphasis on speed, simplicity, and standardization of technic.

Mount Zion Hospital, San Francisco, Calif.
STUDIES OF THE RELATIONSHIPS BETWEEN NEUROPHYSIOLOGICAL AND BEHAVIORAL PROCESSES IN MAN, by Bertram Feinstein. Final rept. for 1 Apr 56-30 June 58 on Contract AF 18(603)48. 17 July 59, 49p. 6 refs. AFOSR-TR-59-58; AD-216 107.
Order from LC mi$3.30, ph$7.80 PB 143 356

Instruments and test facilities developed for research in cerebral electrophysiology under the present contract are described. Two papers are included, a stereotaxic technique in man allowing multiple spatial and temporal approaches to intracranial targets, by Bertram Feinstein and Elwood W. Wright, and a stimulus pulse polarity reversal unit, by W. Watson Alberts (reprint).

Pennsylvania U., Philadelphia.
THERMAL RADIATION IN PHYSIOLOGY, by James D. Hardy. Final rept. for 15 Nov 57-1 July 58 on Contract Nonr-551(11). 15 Nov 58, 7p. 13 refs.
Order from LC mi$1.80, ph$1.80 PB 143 466

Development of a radiometer for recording and measurement of skin temperature.

Quartermaster Research and Engineering Center, Natick, Mass.
EFFECT OF CONTINUOUS COLD EXPOSURE ON NOCTURNAL BODY TEMPERATURE OF MAN, by M. B. Kreider, P. F. Iampietro and others. July 59, 10p. 6 refs. Technical rept. EP-117.
Order from LC mi$1.80, ph$1.80 PB 143 413

Effects of continuous cold stress on 24-hour patterns of body temperature were studied in 5 men. Cold stress consisted of living at 60°F (15.6°C) for 14 days, wearing only shorts. This cold period was preceded and followed by 2 weeks at 80°F (26.7°C). Activity (minimal) and diet were the same for the entire 42-day period. One blanket was used at night. Rectal temperatures (T_r) and skin temperatures (T_s) were measured. During sleep Tr fell more rapidly and to lower values (35.6°C) during cold exposure than during the control period (36.1°C). During sleep T_s was slightly lower in the cold than in the control period; also, T_s did not exhibit the gradual drop characteristic of sleep in the control period. Comparison of T_r and T_s between the first 2 days and the last 2 days of cold period revealed the following differences: (1) nocturnal T_r fell 0.23 degrees C(0.4 degrees F) lower on the later cold nights; (2) nocturnal toe temperatures were 15 degrees C (27 degrees F) higher on the later cold nights. Temperatures of the arch followed the same pattern as those of the toe. No significant differences were found in daytime temperatures between early and later cold days. The data suggest that evidence for acclimatization to cold in terms of altered body temperature responses may be fruitfully sought in responses during rewarming and/or sleep.

St. Louis U. School of Medicine, Mo.
FAILURE IN TEMPERATURE REGULATION DURING PROGRESSIVE DEHYDRATION, by Alrick B. Hertzman and Iain D. Ferguson. Rept. on Physiology of Flight, Contract AF 33(616)3357. July 59, 32p. 44 refs. WADC Technical rept. 59-398.
Order from OTS $1.00 PB 161 084

During exposure to an ambient temperature of 43.3°C. (110°F.) without food or water, the body weights of young male subjects decreased at the rate of 0.5 per cent per hour of exposure, their body temperatures rose 0.1°C. per hour, but the total sweat production changed little despite the increase in body temperature Calculations indicated that the latter was due to a slightly inadequate sweating which in turn was attributed to a rising thermal threshold for sweating. Regional sweating rates varied widely during the exposure, particularly on the upper parts of the body. Cutaneous conductances, thermal circulatory indices and the pad pulses in the finger and toe changed very little; there was no evidence of peripheral circulatory failure in these experiments. The theoretical implications are discussed.

School of Aviation Medicine, Randolph AFB, Tex.
AUDITORY ACUITY MEASURED BY AUTOMATIC AND MANUAL AUDIOMETRY, by Max H. O'Connell. Nov 57, 6p. 11 refs. Rept. 58-13.
Order from LC mi$1.80, ph$1.80 PB 138 995

Auditory thresholds were established for 24 subjects on the Rudmose model ARJ-3 audiometer, on the SAM model 56-2 automatic audiometer, and on the standard Maico H-1 audiometer. The test results are compared by percent agreement and probability of such differences occurring by chance. The result of one retest per subject is also given. Additional test-retest data obtained at the 1955 Wisconsin State Fair, using the SAM model 56-2, are presented.

School of Aviation Medicine, Randolph AFB, Tex.
MEASUREMENT OF AUDITORY THRESHOLD BY MANUAL AND SAM AUTOMATIC AUDIOMETRY, by Max H. O'Connell and Paul M. Baccaro. Mar 59, 11p. 10 refs. Rept. 58-131.
Order from LC mi$2.40, ph$3.30 PB 143 746

Threshold data were obtained on two groups of unskilled listeners -- one group with "normal" hearing and the other with "subnormal" hearing. No significant differences were found between the single descent and triple descent audiometric technics when averaged

over the two groups; test-retest reliability coefficients were . 84 and . 96 for the normal and subnormal groups, respectively. The SAM Model 57-1 automatic audiometer provided test results which were significantly different from the average of single and triple descent audiometry. Test results showed significantly poorer thresholds at 500, 1000, and 6000 cps, a significantly better threshold at 4000 cps, and no significant difference at 2000 cps for the normal group. The subjects in the subnormal group showed significantly poorer thresholds at 500, 1000, 2000, and 6000 cps, significantly better thresholds at 4000 cps, and no significant difference at 3000 cps. Although the results showed statistically significant differences between manual and automatic audiometry, the three test methods yielded mean threshold scores which were highly similar.

School of Aviation Medicine, Randolph AFB, Tex.
PHYSIOLOGIC RESPONSE TO SUBGRAVITY: MECHANICS OF NOURISHMENT AND DEGLUTITION OF SOLIDS AND LIQUIDS, by Julian E. Ward, Willard R. Hawkins, and Herbert D. Stallings, Jr. Jan 59, 5p. 4 refs. Rept. 59-2.
Order from LC mi$1. 80, ph$1. 80 PB 143 585

In order to study the mechanics of nourishment during weightlessness, 165 subgravity parabolas were flown in an F-94C aircraft. Twenty-five experimental subjects attempted to drink from an open container, a contained fitted with pierced lid and plastic straw, and a plastic squeeze bottle. Observations were made regarding deglutition of solids, including swallowing of both well and poorly masticated boli. Drinking from open containers proved to be more difficult than had been anticipated. For reasons of safety, closed containers, such as squeeze bottles, must be used to transfer liquids to the mouth under conditions of zero-gravity; the use of straws is not practical. Deglutition of liquids or well masticated solids can be accomplished with little or no difficulty in the weightless state. However, a large solid bolus of food is a potential aspiration problem. Regurgitation of stomach contents may become a serious annoyance during orbital flight. Only a small quantity of liquids should be taken at one time. Movements or abdominal pressures, which may initiate vomiting, must be avoided.

School of Aviation Medicine, Randolph AFB, Tex.
SOURCES OF VARIABILITY AMONG ARTICULATION TESTS FOR NORMAL EARS WITH PB WORD LISTS, by Asher S. Wolfe and Max H. O'Connell. Mar 59, 7p. 12 refs. Rept. 58-123.
Order from LC mi$1. 80, ph$1. 80 PB 143 747

Results of the experiment indicated that: (1) test scores were poorer for the higher signal intensity levels; (2) one test list was definitely more intelligible than the other three lists at all presentation levels; (3) linear increases in articulation scores, as the tests proceeded, were not significant thus tending to refute a learning effect; and (4) the low reliability of these lists precludes the acceptance of the test material as a reliable measurement tool.

University Hospitals, Iowa City, Iowa.
BEATS IN COCHLEAR MODELS, by Juergen Tonndorf. June 59, 22p. 18 refs. AFSAM rept. 59-57.
Order from LC mi$2. 70, ph$4. 80 PB 143 584

Beats in cochlear models were studied from two aspects: (1) Their effect upon cochlear fluid motion which, occurring along elliptic orbits, essentially represent Lissajous figures. The orbits expanded and contracted synchronously with the beat rate. Thereby, a partial rectification (asymmetric expansion) became apparent which, occurring in opposite directions in the two scalae across the partition, constituted the beat. This latter phenomenon was caused by the stiffness gradient of the cochlear partition. (2) Their effect on the traveling wave pattern along the partition was originally described by Bekesy. Stroboscopic examination revealed that the beat frequency modulates the two primaries thus producing two additional side bands. The displacement pattern of the membrane when viewed by high-speed motion picture photography, however, did not give any evidence of these five frequencies. Only the intertone (and the beat) were present. It then became apparent that the model is really a pattern analyzer of complex sound. In terms of cochlear fluid motion, it is able to resolve complex Lissajous figures by a spatial filter action along the partition into simple Lissajous figures. Any deviation from steady Lissajous figures, which ordinarily result from primaries in relation of integral numbers, produces beats. Thus beats of imperfect unison as well as of mistuned consonances have essentially the same cause: a cyclic phase change between the two primaries.

Vision Research Labs., U. of Michigan, Ann Arbor.
THE EFFECTS OF TARGET SIZE AND SHAPE ON VISUAL DETECTION: II. CONTINUOUS FOVEAL TARGETS AT ZERO BACKGROUND LUMINANCE, by H. Richard Blackwell and Stanley W. Smith. Rept. on Proj. Michigan, Contract DA 36-039-sc-52654. Jan 59, 26p. 8 refs. 2144-334-T.
Order from LC mi$2. 70, ph$4. 80 PB 143 442

In this experiment, the luminance difference for threshold detectability has been measured for 45 targets of varying size and shape at a zero background luminance. Measurements have been made on eleven observers with the method of constant stimulus utilizing the temporal forced-choice procedure. Foveal presentation has been used, with an exposure duration of 0. 010 second. The targets used have included circles, rectangles, multiple-legged targets, and special targets composed of two rectangular areas of different dimensions. In all cases, noncircular targets were less detectable than circular targets of equal area. The data for noncircular targets have been subjected to empirical and theoretical analyses. The empirical analysis described the data of the present study in some detail. The data were also analyzed in terms of the theoretical analysis, based upon an element contribution hypothesis, with additional empirical factors. Application of this analysis to the data from the present study required modification of one of the two empirical factors derived from the first study, and addition of a third empirical factor. Accordingly, the theoretical analysis appears to have demonstrated somewhat less descriptive generality than the empirical analysis. (See also PB 142 793)

Vision Research Labs., U. of Michigan, Ann Arbor.
THE EFFECTS OF TARGET SIZE AND SHAPE ON VISUAL DETECTION: III. EFFECTS OF BACKGROUND LUMINANCE, DURATION, WAVELENGTH AND RETINAL LOCATION, by S. W. Smith, H. R. Blackwell, and C. M. Cutchshaw. Rept. on Proj. Michigan, Contract DA 36-039-sc-52654. Dec 58, 21p. 11 refs. Rept. no. 2144-346-T.
Order from LC mi$2.70, ph$4.80 PB 143 444

This experiment studied the comparative detectability of circular and noncircular targets under a variety of conditions. It was found that noncircular targets were usually considerably less detectable and were never more detectable than circular targets of equal area. The primary objective was to investigate to what extent two targets of markedly noncircular form are more or less detectable than circular targets of equal area. A long thin rectangle and a cross produced from two long thin rectangles were selected for study on the basis of earlier studies in the present series. Background luminance was varied over a considerable range, as were target duration, spectral composition and retinal location. Detection thresholds were measured by the temporal forced-choice procedure. (See also PB 143 442)

Vision Research Labs., U. of Michigan, Ann Arbor.
THE EFFECTS OF TARGET SIZE AND SHAPE ON VISUAL DETECTION: IV. SOME RELATIONS WITH PREVIOUS INVESTIGATIONS, by H. Richard Blackwell. Rept. on Proj. Michigan, Contract DA 36-039-sc-52654. Feb 59, 24p. 12 refs. Rept. no. 2144-335-T.
Order from LC mi$2.70, ph$4.80 PB 143 441

The basic approach of the present report is to reanalyze data from the earlier reports in the series to facilitate comparison with the data of earlier investigators. An investigation has been made of the adequacy of the perimeter theory of Lamar, et. al., in rectifying data from the previous papers in this series. This formulation is shown to have considerable predictive success with the data of Kristofferson and Blackwell. However, it is believed that the formulation cannot be supported in detail, and that the empirical and theoretical formulations offered in earlier papers in the present series represent refinements on the perimeter theory. (See also PB 143 444)

Biochemistry

Arctic Aeromedical Lab., Ladd AFB, Alaska.
THE EFFECT OF AN EXCESS OF VITAMIN A ON OXYGEN CONSUMPTION AND I^{131} METABOLISM IN RATS, by Gisle Bang, Delilah Metz, and Kaare Rodahl. Aug 57, 21p. 9 refs. Technical rept. 57-39.
Order from LC mi$2.70, ph$4.80 PB 143 529

The effects of excess of vitamin A--both single doses and repeated doses over prolonged periods--on the energy metabolism and the I^{131} metabolism in rats have been studied. It may be concluded that the feeding of an excess of vitamin A has no effect on the resting metabolism, the thyroid uptake of I^{131}, the plasma I^{131}, the PBI^{131}, or the conversion ratio in normal male rats under the conditions studied.

Army Chemical Corps., Fort Detrick, Md.
RECOMMENDED PROCEDURES FOR THE IDENTIFICATION OF SELECTED PATHOGENIC MICROORGANISMS: BACTERIA, FUNGI, AND ANTIBIOTIC SUSCEPTIBILITY DETERMINATIONS, by Joshus M. Leise, Harold Friedlander and others. Second edition, rev. Mar 58, 105p. 48 refs.
Order from OTS $2.50 PB 161 063

The manual is organized in a sequence identical with that of the basic steps followed in identification procedures, with the sections on methods and materials placed at the end: Section I, Treatment of Unknown Samples, describes the concentration and fractionation procedures. Section II, Initial Identification Procedures, outlines the steps to be followed in identifying either mixed or pure cultures. Section III, Inoculation of Media, lists the various media which are to be inoculated with the unknown sample to insure the growth and subsequent identification of the unknown pathogenic microorganisms. Section IV, Colonial Descriptions of Pathogenic Microorganisms, describes the colonial appearance of selected pathogens on eight of the media listed in Section III. Section V, Group Identification, arranges the microorganisms into groups to facilitate tentative identification if one assumes that the organism in question is pathogenic. Section VI, Specific Microorganism Identification, contains descriptions of and identification procedures for each microorganism and toxin listed in the manual. Section VII, Determination of Antibiotic Susceptibility, gives directions for determining the antibiotic susceptibility of the isolated microorganism. Section VIII, Methods, comprises detailed descriptions of some of the procedures referred to in the text. Section IX, Materials, lists the formulas for some of the media and reagents referred to in the text, including the source of components.

California U., Los Angeles.
THE BINDING OF STEROIDS BY BLOOD PROTEINS, by B. H. Levedahl. Annual progress rept. for Jan 56-Jan 57 on Contract Nonr-233(39). 18 Dec 56, 5p.
Order from LC mi$1.80, ph$1.80 PB 130 572

The object of this program is to study the interaction of steroid hormones with serum proteins so that the mechanism of interaction of steroids and proteins can be accurately described.

Duke U. School of Medicine, Durham, N. C.
PHOTOGRAPHIC MEASUREMENT OF RETINAL VENOUS BLOOD OXYGEN; VALUES IN NORMAL SUBJECTS AND THE EFFECT OF CHANGE IN BODY POSITION AND IN THE INHALATION OF LOW AND HIGH OXYGEN MIXTURES, by John B. Hickam and Regina Frayser. Feb 59, 13p. 6 refs. AFSAM rept. 58-155.
Order from LC mi$2.40, ph$3.30 PB 143 745

A method is described for measuring by photographic

means the percent oxygen saturation of retinal venous blood. In observations on 34 normal, seated subjects, the retinal venous blood oxygen saturation was estimated to be 57 percent. S.D. 11 percent. When the arterial blood oxygen is reduced by breathing a low oxygen mixture, the retinal venous blood oxygen falls, but less than the arterial oxygen, with a resultant decrease in the retinal arteriovenous oxygen difference. Presumably this is associated with an increased retinal blood flow, resulting from the visible dilatation of the retinal vessels. In 12 subjects, changing from the seated to the recumbent position caused an apparent small drop in retinal venous oxygen saturation, but the change was not statistically significant. In 17 subjects, breathing 100 percent oxygen caused an increase of 24 percent in the retinal venous blood oxygen saturation. This effect is much larger than anticipated and the mechanism of the increase is still obscure.

School of Aviation Medicine, Randolph AFB, Tex.
AORTAL CHOLESTEROL CONCENTRATIONS AFTER LINODOXINE ADMINISTRATION IN DOGS, by Lawrence J. Milch, Lesly G. Robinson and others. June 59, 5p. 5 refs. Rept. 59-73.
Order from LC mi$1.80, ph$1.80 PB 143 375

Linodoxine was added to the diet of 6 dogs fed excess fat, cholesterol, and propylthiouracil over a 9- to 11-week period. Administration of this drug mixture was associated with significantly ($P < .05$) decreased concentrations of aortal cholesterol as compared to a simultaneously maintained group of dogs fed the same diet containing a placebo mixture of coconut oil in place of Linodoxine. Linodoxine was also associated with a significant shift of serum β-lipoproteins toward classes of higher density, a reversal of the trend noted in the placebo-fed group of dogs.

Texas U. Medical Branch, Galveston.
PROPERTIES OF ERYTHROCYTES WHICH MAY INFLUENCE THE CONVERSION OF PROFIBRINOLYSIN TO FIBRINOLYSIN, by S. N. Kolmen, M. Mason Guest and D. R. Celander. June 59, 9p. 15 refs. AFSAM rept. 59-72.
Order from LC mi$1.80, ph$1.80 PB 143 376

Evidence is presented that erythrocytes adsorb urokinase, a urinary activator of plasma profibrinolysin, and that in the adsorbed state urokinase not only remains active but is "protected" from factors normally present in plasma. When washed red cells, devoid of components of the fibrinolytic system, are exposed to plasma they acquire simultaneously inhibitors to urokinase and an agent capable of lysing a fibrin clot. Evidence is presented that these acquired properties are the result of adsorption to the erythrocyte of factors present in plasma and that this adsorption is affected by the fibrinolytic status of the animal from which the plasma and erythrocytes are obtained. The significance of the erythrocyte in the development of in vivo fibrinolytic activity is discussed.

Medical Specialties and Equipment

Microwave Lab., Stanford U., Calif.
DEVELOPMENT OF A LINEAR ELECTRON ACCELERATOR FOR MEDICAL AND RADIOGRAPHICAL PURPOSES. Final rept. for 1 Mar 52-31 May 58 on Contract Nonr-225(06). May 58, 38p. 5 refs. ML rept. no. 518.
Order from LC mi$3.00, ph$6.30 PB 142 959

A sealed-off linear electron accelerator for medical use has been developed, and its operation for routine cancer therapy has proved very satisfactory. The construction of more compact accelerators operating at shorter wavelengths has been shown to be feasible. The major cost of such accelerators is in the rf power supply and the mechanical mounting, and it is in these components that further development is required if the overall cost is to be significantly reduced. This final report summarizes the individual aspects of the contract research, and also contains a list of the Technical Reports that have been issued. A reprint of a summary paper on "The Stanford Medical Linear Accelerator," not previously issued, is also included.

School of Aviation Medicine, Randolph AFB, Tex.
CLINICAL EVALUATION OF DEVICES AND TECHNICS FOR THE REMOVAL OF TOOTH STRUCTURE, by Jack L. Hartley and Donald C. Hudson. Mar 59, 22p. 121 refs. Rept. 58-103.
Order from LC mi$2.70, ph$4.80 PB 143 382

Dental handpieces utilized for the removal of tooth structure have been evaluated. A clinico-laboratory study was made of all currently available handpieces, the newer concepts of operative and crown and bridge procedures, and the necessary armamentarium. The studies indicated that instruments which produced the ultrahigh speeds (180,000 to 225,000 r.p.m. and above) resulted in maximum cutting effectiveness, minimal pulpal trauma, reduced operator fatigue with optimum control, low patient annoyance, and increased life of cutting instrument. At present, these speeds are attained by the air turbine handpieces.

School of Aviation Medicine, Randolph AFB, Tex.
A CLINICAL EVALUATION OF THE CAVITRON PORTABLE PROPHYLAXIS UNIT, by Clarence M. McCall and Lucian Szmyd. July 59, 13p. 4 refs. Rept. 59-86.
Order from LC mi$2.40, ph$3.30 PB 143 379

A clinical evaluation of the ultrasonic scaling technic was carried out on 240 military subjects. The ultrasonic technic was found to be as effective as the conventional scaling method in the removal of calculus while the conventional oral prophylaxis technic was superior to the ultrasonic method in the removal of stain. Most of the subjects preferred the ultrasonic method of oral prophylaxis over the conventional scaling technic. No statistical difference in tooth sensitivity or tissue trauma was noted between the two scaling technics.

School of Aviation Medicine, Randolph AFB, Tex.
FREE 17-HYDROXYCORTICOSTEROID LEVELS IN PAROTID FLUID, SERUM, AND URINE FOLLOWING THE ORAL ADMINISTRATION OF SYNTHETIC ANALOGS OF HYDROCORTISONE, by Ira L. Shannon and John R. Prigmore. May 59, 4p. 3 refs. Rept. 59-79.
Order from LC mi$1.80, ph$1.80 PB 143 743

In a study of free 17-hydroxycorticosteroids, measurable levels were consistently found in human parotid fluid. Under the influence of synthetic adrenocortical analogs, altered parotid steroid levels closely paralleled changes evidenced in serum and urine 17-OHCS concentration. These findings suggest that steroid values in parotid fluid can be used as an indicator of adrenocortical status.

School of Aviation Medicine, Randolph AFB, Tex.
THE INFRARED SPECTRAL CHARACTERISTICS OF HUMAN WHOLE STIMULATED SALIVA COLLECTED FROM INDIVIDUALS CLASSIFIED AS TO DENTAL CARIES EXPERIENCE, by Norman O. Harris, Arnold Swanson, and Vincent Segreto. June 59, 8p. 35 refs. Rept. 59-60.
Order from LC mi$1.80, ph$1.80 PB 143 372

Infrared spectral curves (2-16 μ) were accomplished on the saliva of 398 United States Air Force enlistees, who were classified according to dental caries status. Slight variations in the characteristic absorption spectra of human saliva appeared correlated with the carious surface score. Infrared scores, based on spectral curve characteristics, were inverse to 24-hour bacterial turbidity readings and directly correlated to flow rate. Infrared analysis presents a potential method for evaluating the immediate caries susceptibility status of an individual; however, this hypothesis needs confirmation in a time-function study.

School of Aviation Medicine, Randolph AFB, Tex.
SPECTROPHOTOMETRIC CHARACTERIZATION OF LIGHT-INDUCED CHANGES IN AUTOPOLYMERIZING RESINS. EFFECT OF ULTRAVIOLET LIGHT UPON PLASTIC SPECIMENS CONTAINING EXCESS LIQUID, by Bertram Eichel, Theodore E. Fischer and others. Nov 56, 6p. 4 refs. Rept. 56-124.
Order from LC mi$1.80, ph$1.80 PB 128 453

Nonpigmented Kadon and Fastcrown polymerized specimens into which excess liquid had been incorporated were characterized spectrophotometrically following their exposure to ultraviolet radiation. After long-wave ultraviolet radiation, Kadon exhibited increased visible and near ultraviolet absorption with increased liquid content. Short-wave ultra-violet radiation did not produce increased absorption effects with the increase in liquid. Fastcrown specimens containing excess liquid showed colored substance production following exposure to short-wave ultraviolet radiation and the S-1 lamp. With increase in liquid content, a parallel increase in absorption in the near ultraviolet region was clearly evident. Results suggest that the employment of excess liquid in the liquid-powder mix even at normal room temperatures is the responsible factor for the excessive color produced in plastics following their polymerization.

Microbiology

[Army Chemical Warfare Labs., Army Chemical Center, Md.]
AEROBIOLOGICAL STUDIES: SONIC-SPEED, LIQUID IMPINGER FOR COLLECTING SAMPLES OF MICROBIOLOGICAL MATERIALS FROM AEROSOLS, by C. E. O'Bryon. July 48, declassified 29 Aug 56, 35p. 32 refs. Special rept. no. 98.
Order from LC mi$3.00, ph$6.30 PB 143 722

A sonic-speed, liquid impinger used by the Aerobiology Branch in collecting samples of particulate matter (containing such materials as bacteria, dye tracers, toxins, and viruses) from aerosols is described. This sampler consists of a 125-ml. filtering flask containing an intake tube held in place by a rubber stopper with the lower end of the tube 5 mm. from the floor of the flask. The intake tube is a tube 1 cm. in diameter having a piece of capillary tubing sealed to its lower end. The diameter of the capillary tube or orifice is such that the maximum flow, or the flow at which the velocity of air through the orifice is the same as that of sound, is the desired sampling rate. Twenty-five ml. of a liquid suitable for holding the particulate matter to be sampled is used in the impinger. Sampling efficiency was found to be high (well over 90 per cent) by material-balance and series-sampling procedures.

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
INVESTIGATIONS ON THE RELATION, IF ANY, BETWEEN VIABILITY AND ELECTRIC CHARGES ON AIR-BORNE MICROORGANISMS OR PARTICLES CONTAINING SUCH MICROORGANISMS, by Clyde Orr, Jr., and Margaret C. Kordecki. Final rept. on Contract DA 18-064-404-CML-39. 30 June 55, 87p. 13 refs.
Order from LC mi$4.80, ph$13.80 PB 143 535

The principal results obtained are: (1) There is little or no relation between the charge on an air-borne microorganism and viability or nonviability. (2) Wet and dry dispersions revealed no significant differences in regard to the relation between charge and viability. (3) Atmospheric conditions have no significant effect on the relation between charge and viability. (4) Temperature and humidity have little or no effect on the charging of microorganism aerosols. Radiation and ionization, on the other hand, tend to increase the charging. (5) Radiation and ionization, probably through a lethal agent such as ozone, decrease viability. (6) No additives were found which produced significant changes in the charge-viability relationship. (7) Ordinarily, the charges on aerosol particles contribute little to the loss of the particles on surfaces, etc. (8) Viable, air-borne microorganisms can be collected and cultured using thermal precipitation. (9) Serratia marcescens cell size and density vary in a definite fashion with relative humidity, a maximum density occurring at a relative humidity of about 40 per cent.

Illinois U., Urbana.
INVESTIGATION OF THE EFFECTS OF SALTS AND LIMITATION OF MOISTURE CONCENTRATIONS ON THE GERMINATION OF SPORES, by H. O. Halvorson. Rept. no. 3 (Final) for 1 Jan-31 Dec 56 on Contract DA 19-129-567. 1 Jan 56, 5p. 2 refs. QFCIAF File no. M-204; AD-128 285.
Order from LC mi$1.80, ph$1.80 PB 138 910

Pathology

Army Chemical Warfare Labs., Army Chemical Center, Md.
SOME EFFECTS OF CERTAIN CHEMICAL AGENTS ON MOTOR AND MENTAL PERFORMANCE, by Earl Davy and George Grosser. Mar 59, 27p. 4 refs. CWL Special Pub. 2-20.
Order from LC mi$2.70, ph$4.80 PB 143 717

The effect of sublethal concentrations of GB on humans were experimentally investigated following whole-body exposure of human subjects to GB at a concentration of 2 mg/m^3 for 2 minutes. Subjects were exposed to GB and post-exposure performance on a battery of tests was compared with performance during the final pre-exposure session. The battery of tests, related to steadiness, dexterity, addition ability, reaction time, and eye-hand coordination, was administered during three pre-exposure and three post-exposure sessions. Performance was not severely impaired by GB exposure at the Ct employed. Improved performance was noted in many tests. While hand steadiness may be slightly impaired in proportion to cholinesterase activity decrement, the extent of cholinesterase inhibition was found to be unrelated to the extent of either an impairment or an improvement of performance on the other tests.

[Army Chemical Warfare Labs.] Army Chemical Center, Md.
THE TOXICOLOGY OF FIRE, by John A. Zapp, Jr. Apr 51, declassified 29 Jan 56, 119p. 50 refs. Medical Div. Special rept. no. 4.
Order from LC mi$6.00, ph$18.30 PB 143 732

An investigation into the casualty producing factors in flame attack. The experiments first carried out were designed to measure quantitatively and continuously before, during and after flame attack the air temperature and the concentration of various gases in the atmosphere (O_2, CO, CO_2, and hydrocarbons) which might contribute to the production of casualties. The methods finally adopted are described. Problems of protection against flame attack were also studied.

Army Medical Research and Nutrition Lab., Denver, Colo.
THE LOW INCIDENCE OF ACUTE REACTIONS IN HUMANS TO AN INTRAVENOUS FAT EMULSION, by Allan L. Forbes, Mayna R. Allen and Hugh F. Gray. Rept. on Metabolism and Nutrition. 8 Oct 58, 28p. 13 refs. Rept. no. 227.
Order from LC mi$2.70, ph$4.80 PB 138 599

The administration of 868 units of an intravenous fat emulsion to 204 subjects resulted in definite acute toxic reactions in 7.8% of subjects; clearly defined febrile reactions occurred in 4.9%. Chills occurring in 2.5% of subjects were the only serious reactions. If acute toxic reactions were going to occur during a series of infusions, they appeared with few exceptions on the first infusion. Tolerance developed to febrile reactions on serial infusions. The rate of administration did not affect materially the incidence of reactions within reasonable limits; a 600 ml unit could be administered safely in 1.75 hours. The majority of acute toxic reactions appeared to represent hypersensitivity phenomena. The fat emulsion studied is considered an acceptable preparation for clinical use from the point of view of infrequency of acute toxic reactions. The importance of turning primary attention to possible chronic toxicity problems is emphasized.

Army Medical Research Lab., Fort Knox, Ky.
THE EFFECTS OF INTENSE VIBRATION, by A. J. Riopelle, Marion Hines (Emory U.) and Merle Lawrence (U. of Michigan). Rept. on Task, Noise, and Vibration Problems, Contracts DA 49-007-MD-(535, 634). 10 Oct 58, 63p. 16 refs. Rept. no. 358; AD-203 637.
Order from LC mi$3.90, ph$10.80 PB 143 264

The primary effects of vibration are physiological and anatomical in nature. Behavioral decrements are secondary and probably a consequent of these changes.

Audiology Lab., Northwestern U., Evanston, Ill.
SOME FACTORS AFFECTING THE SPONDEE THRESHOLD IN NORMAL-HEARING SUBJECTS, by Tom W. Tillman and James F. Jerger. May 59, 6p. 3 refs. AFSAM rept. 59-69.
Order from LC mi$1.80, ph$1.80 PB 143 378

This experiment was designed to investigate the effects of (1) knowledge of test vocabulary and (2) practice in responding to spondee words at threshold intensities on the spondee threshold in normal-hearing subjects. Results of this experiment were: (1) practice in responding to spondee words at threshold intensities does not influence the spondee threshold in normal-hearing subjects, and (2) normal-hearing subjects given prior knowledge of the test vocabulary yield spondee thresholds 4 to 5 db lower than those yielded by subjects not given such knowledge.

Brooke Army Medical Center, Fort Sam Houston, Tex.
RADIATION AND THERMAL BURNS, by Duane L. Larson, Charles R. Baxter and others. Annual research progress rept. on Proj. no. 6-59-12-028. 30 June 59, 138p. 47 refs.
Order from LC mi$6.90, ph$21.30 PB 143 605

Contents:
Biochemical alterations:
Relationship of dark urine to septicemia
Acute cardiopulmonary response to extensive thermal trauma

Metabolic responses:
Wound management and nitrogen metabolism in burned rats
The effect of varying the calories on the nitrogen balance of burned patients
Absorptive capacity of the small intestine during the course of a severn burn
Infection and immunologic studies:
Evaluation of the use of gamma globulin in the severely burned patient
Immuno-electrophoretic studies of serum globulins in thermal injury
Studies of urinary tract infections in burned patients
Serologic demonstration of existence of "burn toxin" in the serum of newly burned individuals and the antibody of this toxin in convalescent burned patients
The use of pooled antigen to induce antibody paralysis in neonatal rats
Antiseptic effect of PVP-I and bis quaternary compounds on selected bacteria inoculated to the burned skin surface of rats
Clinical management:
Clinical operation, burn center
Early excision of extensive areas of full-thickness burns
The effects of environmental conditions upon the response to thermal trauma in rats
Environmental factors in burns. I. O_2 utilization vs. ambient temperature

Central Tuberculosis Lab., Southwest Florida Tuberculosis Hospital, Tampa.
A BACTERIOLOGIC STUDY OF RESECTED LUNG TISSUE, by Robert Cacciatore and Frank P. Dunbar. Apr 59, 6p. 9 refs. AFSAM rept. 58-120.
Order from LC mi$1.80, ph$1.80 PB 143 748

During the 17-month period from July 1956 through November 1957 all resected lung tissues were examined by bacteriologic procedures designed to investigate some of the problems of isolating and determining the drug-susceptibilities of cultures of Myco, tuberculosis. This report presents the results of the study.

Duke U. Medical Center, Durham, N. C.
THE INFLUENCE OF VENOUS INFUSION OF GASEOUS CARBON DIOXIDE ON OXYGEN SATURATION OF ARTERIAL BLOOD AND CARDIAC OUTPUT IN THE ANESTHETIZED DOG, by F. G. Hall and John Salzano. Rept. on Physiology of Flight, Contract AF 33(616)3821. July 59, 9p. 4 refs. WADC Technical rept. 59-378.
Order from OTS $0.50 PB 161 074

The formation of gas bubbles in the blood stream has been a problem of high-altitude flight. When gaseous bubbles of oxygen and nitrogen are infused into the venous system, profound injury results. Gaseous CO_2 however may be infused at rates of 100 ml. per minute without irreversible damage. A notable feature of the procedure is reduction of arterial oxygen saturation of hemoglobin. Cardiac output was measured in dogs before, during, and after intravenous infusion of gaseous CO_2. Slight decreases in output occurred but not great enough to indicate a significant impairment in blood flow through the pulmonary system. Infused CO_2 moves rapidly into the expired gas. Lowered oxygen saturation of blood following infusion of CO_2 can be explained in part by Bohr effect. However, this does not account entirely for level of oxygen unsaturation and something more than Bohr effect seems involved.

Harvard U. [Cambridge, Mass.]
THE STUDY OF FATIGUE IN NORMALS AND PATIENTS WITH NEUROLOGICAL AND PSYCHIATRIC DISORDERS, by Robert S. Schwab and Mary A. B. Brazier. Final rept. for 1947-1957 on Contract N5ori-76/08. Oct 58, 22p.
Order from LC mi$2.70, ph$4.80 PB 143 395

The normal subject shows better motor performance than patients with psychiatric fatigue but the differences are not very marked nor are they consistant. There is a marked difference, however, between the motor performance between the normal subject and those suffering from myasthenia gravis. The difference in training, general physical tone of a person not in the hospital or not ill, might account for some of the minor discrepancies. We have confirmed previous observations that neostigmine or other anticholinesterase drugs do not improve the muscular performance of normals or patients with psychiatric fatigue, and in the figure one can see a slight decrement in the performance after the injection of such a drug. In both examples shown there was a slight increase in the blood lactic acid after the injection of neostigmine, in normals, and psychiatric fatigue. In patients with myasthenia gravis, however, there is a marked increase in motor performance as well as increase in lactic acid after the injection of neostigmine. We are impressed with the striking and objective difference between the ordinary test situation where motivational levels were not altered and the increase in motor performance following a strong suggestion and urging, and even more impressive improvement in motor performance with a finite reward such as five dollars. It was agreed that usually in the ordinary testing of average subjects, particularly if they have repeated tests several times under the same laboratory conditions and personnel, that representative values are not too difficult to find. In any individual situation the motivational level may be of extreme importance in the differential diagnosis or in the concept of the dynamics in the fatigue and impaired state.

Hospital Henri-Rousselle, Paris (France).
RELATION OF THE VISCERAL AFFERENTS ON THE ACTIVITY OF THE BRAIN STEM RETICULAR FORMATION, by P. C. Dell. Technical rept. on Contract AF 61(052)45. [1959] 17p. 8 refs. AFOSR-TR-59-93; AD-219 422.
Order from LC mi$2.40, ph$3.30 PB 143 587

This report comprises two parts: 1/ a preliminary study on the arousing potentiality of afferent impulses in connection with the cortical control of reticular activity 2/ a study of the effects of the humoral changes induced by hypoxia on the reticulo-cortico-reticular system.

Karolinska Institutet, Stockholm (Sweden).
RESEARCH REPORT FOR 1958, by Arne Engstrom. Rept. on Contracts AF 61(052)21 and AF 61(052)15.

[1959] 27p. AFOSR-TN-340; AD-213 661.
Order from LC mi$2.70, ph$4.80 PB 143 071

The report is an account of the scientific activities at the Department of Medical Physics, Karolinska Instituet, during 1958. Several new techniques have been developed with the aim to be applicable to the study of the molecular structure of minute parts (on cellular level) of the nervous tissue. There is considerable work to formulate certain general theories regarding information transfer in minute structures and also to investigate carefully the physico-chemical aspects of tracer experiment for metabolic studies.

Neurological Research Unit., Medical Research Council (Gt. Brit.).
CORRELATION OF INTRACELLULAR POTENTIALS WITH ELECTRO-CORTICOGRAM. Final technical rept. no. 1, 1 Jan-31 Mar 59, on Contract DA 91-508-EUC-309. 23 Apr 59, 15p. AD 217 435.
Order from LC mi$2.40, ph$3.30 PB 143 390

The primary object of these experiments was the correlation of the activity of single cortical neurones (Betz cells) recorded with micropipettes, with the pattern of electrical activity recorded with larger electrodes. In particular, a correlation was sought between the membrane potential of Betz cells with the various clinical and electrical phases of a generalized seizure. From the results of the experiment during an induced seizure and a number of experiments during strychnine spikes it appears likely that the cortical neurones cease to discharge continuously during the clonic phase of the seizure. This appears to be associated with a hyperpolarization but there is not as yet sufficient evidence to make this a causal relationship. It is expected that in the following period of investigation the causal nature of this relationship may well be demonstrated and that the existence of a Golgi cell type of hyperpolarization-inhibition mechanism may be demonstrated. Such a demonstration would cast a rather different light on the Jacksonian concept of a seizure as an "uncontrolled" discharge of nerve cells.

School of Aviation Medicine, Randolph AFB, Tex.
AN EVALUATION OF PATIENTS SUSPECTED OF HAVING NOISE-INDUCED HEARING LOSS, by Ralph N. Kraus. June 59, 17p. 17 refs. Aeromedical Reviews no. 4-59.
Order from LC mi$2.40, ph$3.30 PB 143 367

The results of an evaluation of 77 U. S. Air Force flight-line personnel with defective hearing are reported. The evaluation revealed that 29 patients had a conductive-type, 7 had a functional-type, and 41 had a perceptive-type defect. Twenty-two of these perceptive cases were unilateral. In only 19 cases was noise exposure considered to be a possible cause of defective hearing. The difficulties encountered in attempting to determine whether defective hearing in a specific patient is caused or aggravated by noise exposure are discussed.

School of Aviation Medicine, Randolph AFB, Tex.
MIGRAINE IN ITS AEROMEDICAL ASPECTS, by Ellis R. Taylor. July 58, 23p. 24 refs. Aeromedical Reviews no. 8-58.
Order from LC mi$2.70, ph$4.80 PB 143 756

Problems in the disposition of migraineurs have become so difficult that a study of the general and aeromedical literature was made to provide a solid foundation for administrative guidelines as well as clinical management. The results of this study are presented along with a general discussion of the natural history of the disease.

School of Aviation Medicine, Randolph AFB, Tex.
THE RELATIONSHIP BETWEEN THE CONCENTRATIONS OF SERUM LIPOPROTEINS AND SERUM LIPIDS, by Bernard S. Schlessinger, Margaret F. Allen and others. Mar 59, 6p. 15 refs. AFSAM rept. 59-45.
Order from LC mi$1.80, ph$1.80 PB 143 369

These studies report (1) the extent of correlation between ultracentrifugally determined serum lipoproteins, (2) the errors of measurement involved in all determinations, and (3) age-specific values for all serum parameters in the same population. It was found that although a high correlation exists between a linear combination of ultracentrifugally determined lipoproteins and the serum concentrations of cholesterol and phospholipid, the prediction of lipoprotein levels from the purely chemical measurements is not entirely satisfactory. Therefore, for the time being at least, all measurements will have to be accomplished.

Pharmacology and Toxicology

Army Chemical Warfare Labs., Army Chemical Center, Md.
THE EFFECT OF SODIUM DINITROCYANOMETHIDE ON ISOLATED CAT PAPILLARY MUSCLE, by Edmund F. Murtha. 6 Aug 57, 9p. 2 refs. Technical rept. CWLR 2154; AD-139 349.
Order from LC mi$1.80, ph$1.80 PB 130 726

Isolated cat papillary muscles were immersed in modified Locke's solution containing sodium dinitrocyanomethide in concentrations ranging from 0.13 to 4.00 mg./ml. Concentrations of or greater than 0.20 mg./ml. gradually reduced and in some experiments abolished the force of the isometric contractions of the muscle; these effects were sometimes accompanied by alterations in the electrogram, although in several experiments there was no evidence of effect on conductivity. The results of these studies agree in general with the findings of another recent investigation which suggests that cardiac depression may be one of the mechanisms of action in sodium dinitrocyanomethide intoxication.

[Army] Chemical Warfare Labs., Army Chemical Center, Md.
PHYSIOLOGICAL ACTIONS OF GB IN A WARM ENVIRONMENT, by H. M. Frankel and F. N. Craig. 4 June 56, declassified 28 Mar 58. 28p. 14 refs.

CWLR-2032.
Order from LC mi$2.70, ph$4.80 PB 143 527

GB was administered to Rhesus monkeys by either an intramuscular injection of an average of 30 γ/kg. or an exposure of the body, not including the head, to an average vapor concentration of 115 mg./m^3 for 30 minutes. Mortality increased when the environmental temperature was elevated. In each method of administration of GB, 4 out of 5 monkeys died at 100°F. At 77°F., one out of 5 died with intramuscular injection and none out of 5 died with body exposure. The loss of cholinesterase (ChE) activity in the red blood cells was more rapid in the monkeys that died than in the survivors. In preliminary experiments the method of restraint was found to influence survival in exposures to heat alone. Wher the monkeys were immobilized on an animal board, 5 out of 6 died in about 5 hours; when more freedom of movement was permitted all 5 survived the same exposure to 100°F.

Army Chemical Warfare Labs., Army Chemical Center, Md.
STUDIES ON THE STRUCTURE OF CLAM POISON, PART II, by W. A. Nevill and E. A. Metcalf. Rept. for 1 July 55-30 June 56. Apr 59, 31p. 13 refs. CWL Special Pub. 1-9.
Order from LC mi$3.00, ph$6.30 PB 143 716

The purpose of the work described in this report was four fold: to obtain a crystalline derivative of clam poison suitable for spectral and microanalytical studies, to isolate and to determine quantitatively the suspected fragments obtained from degradative experiments, to investigate the peroxide oxidation of the poison in greater detail and to synthesize compounds for use as models in determining the mode of attack of acids and oxidizing agents on the poison.

Army Chemical Warfare Labs., Army Chemical Center, Md.
SWIMMING OF ALBINO MICE, by Charles G. Wilber and Joseph B. Hunn. Technical rept. for 5 Jan-16 June 58 on Biological Sciences Research. Oct 58, 9p. 5 refs. CWLR 2248.
Order from LC mi$1.80, ph$1.80 PB 139 143

Albino mice were forced to swim to exhaustion in baths of different temperatures at various simulated altitudes up to 30,000 feet. Swimming time was influenced more by bath temperature than by simulated altitude. Crowding decreases the mean swimming time.

Army Medical Research and Nutrition Lab., Denver, Colo.
THE EFFECT OF SEX HORMONES ON ENERGY BALANCE AND BODY COMPOSITION OF RATS, by Robert A. Huseby and Harry J. Krzywicki. 17 Dec 58, 11p. 10 refs. Rept. no. 229.
Order from LC mi$2.40, ph$3.30 PB 139 174

The present study was undertaken to investigate the influence of the administration of an estrogenically active substance, diethylstilbestrol, at a more physiological level upon both the caloric and nitrogen balance and final body composition of young, actively growing, castrate male rats. The study was set up so that data obtained by metabolic balance techniques could be compared with those obtained by direct body composition analysis.

California U., Berkeley. Medical Center, San Francisco.
THE EFFECT OF DEPRESSANT DRUGS AT ALTITUDE, by John E. Preston. Rept. on Contract Nonr-222(29). [1958] 14p. 37 refs.
Order from LC mi$2.40, ph$3.30 PB 143 875

The effects of two Central Nervous System depressant drugs (PBS and Codeine HCl) were studied in vivo and Pentobarbital Sodium effects were studied in vitro. In vitro studies showed a progressive inhibition of oxygen and, to a slightly greater degree, inorganic phosphate uptake by brain homogenate as the concentration of PBS was increased. The effect of PBS on the respiration (P/O values) with various added substrates was studied. In vivo toxicity studies were made using two strains of rat, Sprague-Dawley females and Long Evans males, and determining the LD_{50} values for each drug by two methods, Thompson and Weil and Litchfield-Wilcoxon. The LD_{50} values for PBS in the two strains of rat were not significantly influenced by altitude nor did acclimatization to altitude affect the value appreciably. Codeine HCl in rats was almost twice as toxic at altitude (12,470 feet) as indicated by a LD_{50} value roughly one-half (52.0 mg/Kg) than at sea level (101.1 mg/Kg). Also acclimatization to altitude did significantly decrease the toxic effect of Codeine HCl in rats as indicated by the LD_{50} value of 63.0 mg/Kg.

Medical Coll. of Virginia, Richmond.
HEALTH HAZARD OF MILITARY CHEMICALS, by J. H. Weatherby. Final rept. for 1 Nov 55-30 June 58 on Contract DA 18-108-405-cml-31. 1 July 58, 18p.
Order from LC mi$2.40, ph$3.30 PB 143 783

Progress is reported on studies on toxicity of pentaborane, with special reference to alterations in liver function.

Pharmakologisches Institut der Universität, Frankfurt (Germany)
SNAKE VENOM, by Peter Holtz. Final technical status rept. for Dec 58-Feb 59 on Contract DA 91-508-EUC-291. 21 Apr 59, 15p. AD-217 433.
Order from LC mi$2.40, ph$3.30 PB 143 389

Freshly gained, lyophilized venom of Naia nivea was dialysed exhaustively. The lyophilized dialysate was split into three fractions (α, β and γ) by adsorption on a column of alkaline aluminum hydroxyde and elution with buffers of different molarities. By using sublimable buffers, it was possible to obtain polypeptide fractions free from salt. The lyophilized crude venom, the dialysate, the residue of the dialysis and the fractions α, β and γ of the dialysate were investigated with regard to (1) their toxicity, (2) their inhibitory actions on muscle and neuromuscular transmission, and (3)

their cardiovascular effects. By ultrafiltration and dialysis it was possible to separate the fibrinogen coagulating activity of the venom from the constituents responsible for the formation of bradykinin. Apart from the formation of bradykinin, the dialysate contained esteratic activity (hydrolysis of the benzoyl-arginine-methyl-ester), but no tryptic activity; it did not split benzoylargininamid. Tryptic and coagulating activity remained in the residue of the ultrafiltration or of the dialysis.

Radiobiology

Air Force Missile Development Center, Holloman AFB, N. Mex.
RADIATION HAZARDS OF PRIMARY COSMIC PARTICLES, by Rudolf A. Hoffman. July 59, 40p. 84 refs. AFMDC-TR-59-32.
Order from LC mi$3.00, ph$6.30 PB 143 682

The studies encompassed in this task were primarily designed to determine the biological effects of the primary cosmic particles and more specifically, the heavy primary particles (nuclei ≥ 6).

Aviation Medical Acceleration Lab.; Naval Air Development Center, Johnsville, Pa.
PRELIMINARY STUDIES ON THE MECHANISM OF RADIATION DAMAGE TO OXIDATIVE PHOSPHORYLATION IN SPLEEN MITOCHONDRIA, by B. David Polis and Freeman W. Cope. Rept. no. 6 on Proj. NM 11 01 12.7. 9 July 59, 11p. 12 refs. NADC-MA-5908.
Order from LC mi$2.40, ph$3.30 PB 143 426

Whole-body X-irradiation of rats strongly inhibits oxidative phosphorylation of spleen mitochondria. The addition of serum albumin to the reaction mixture to a great extent reverses this inhibition. The inference is drawn that X-irradiation increases the permeability of spleen mitochondria, allowing the leakage of a heme protein, called mitochrome, which was recently isolated in this laboratory. The inhibitory effects of mitochrome on X-irradiated mitochondria are counteracted by serum albumin in-vitro, so that a partial recovery from the changes caused by irradiation is attained. The data further suggest the possibility of reversing the effects of X-radiation on mitochondria by cofactor replacement, with the implication that resolution of the components involved might be of therapeutic value in irradiation sickness.

California U. School of Medicine, Los Angeles.
LATE EFFECTS OF TOTAL-BODY ROENTGEN IRRADIATION, by Baldwin G. Lamson, Marta S. Billings, and Leslie R. Bennett. May 59, 15p. 7 refs. AFSAM rept. 59-33.
Order from LC mi$2.40, ph$3.30 PB 143 381

Two hundred forty-two female Wistar rats were observed throughout their life span following 1,000 r hypoxic total-body or partial-body irradiation. Hypoxic radiation with superimposed anesthesia resulted in 67 percent 30 day mortality, compared to 9 percent mortality without anesthesia. Selection of the colony by acute postirradiation deaths did not influence the magnitude of late radiation sequelae as measured by life-shortening. Growth retardation during the second postirradiation year was well correlated with life-shortening. Life-shortening was observed after partial-body irradiation to an extent approximately proportional to the weight of radiated tissue. Nephrosclerosis was not observed unless the upper abdomen was included within the radiation field. Other than nephrosclerosis, a similar incidence of disease was observed at death in control and irradiated rats whether partial-body or total-body irradiated.

Oak Ridge National Lab., Tenn.
CHEMICAL PROTECTION OF THE MOUSE AGAINST LEUKEMIA INDUCTION BY X-RAYS, by A. C. Upton, D. G. Doherty, and G. S. Melville, Jr. Apr 59, 5p. 18 refs. AFSAM rept. 59-64.
Order from LC mi$1.80, ph$1.80 PB 143 373

Administration of mercaptoethylguanidine shortly before a single whole-body exposure to 150 or 300 r of x-rays inhibits the induction of granulocytic leukemia and prevents the induction of thymic lymphoma in RF mice. Mice treated with the drug also exhibit less shortening of the life span by radiation than do untreated controls.

Radiobiological Lab., U. of Texas, Austin.
RADIATION-INDUCED GASTROINTESTINAL DEATH IN THE MONKEY, by Stephen G. Wilson, Jr. June 59, 18p. 19 refs. AFSAM rept. 59-77.
Order from LC mi$2.40, ph$3.30 PB 143 582

This report describes the unique changes produced in the gastrointestinal tract of Macaca mulatta monkeys by supralethal doses of gamma radiation and discusses some of the inferences which may be made concerning the probable mechanism of the observed intestinal ulcers.

Radiobiological Lab., U. of Texas, Austin.
TOXIC EFFECTS OF S, 2-AMINOETHYLISOTHIURONIUM DIBROMIDE, by George S. Melville, Jr. and Thomas P. Leffingwell. Aug 59, 8p. 4 refs. AFSAM rept. 59-75.
Order from LC mi$1.80, ph$1.80 PB 143 583

The toxicity and pathologic effects of S, 2-aminoethylisothiuronium dibromide (AET-DiBr), a radioprotectant compound, have been studied in rats. The compound is highly toxic to these rodents when given in acute doses, either orally or intraperitoneally. The chronic toxicity and pathology of AET-DiBr has been examined by means of serial intraperitoneal injections. At low doses, large total amounts of the drug can be tolerated. The acute and chronic effects of sodium chloride, sodium bromide, sodium acetate, and sodium nitrate have been tested. Neither the anions nor the cation appears to contribute to the toxicity of isothiuronium salts.

School of Aviation Medicine, Randolph AFB, Tex.
NEUTRON ACTIVATION OF GOLD DENTAL RESTORATIONS IN SMALL PRIMATES, by Robert W. Zellmer, Jack L. Hartley and others. July 59, 6p. 6 refs. AFSAM rept. 59-68.
Order from LC mi$1.80, ph$1.80 PB 143 377

Dental gold alloys of various kinds were used to cast inlays which were placed in the molars of 10 small primates. These primates were then exposed to the neutron flux of an atomic detonation. The inlays were removed and the neutron-induced activity of the gold was measured in a scintillation counter. Calculation of the total activity showed a correlation with the neutron dosages received by the primates.

School of Aviation Medicine, Randolph AFB, Tex.
THE RADIOBIOLOGY OF THE CANCER CELL, by A. C. Upton (Oak Ridge National Lab.). Jan 59, 22p. 176 refs. Rept. 59-22.
Order from LC mi$2.70, ph$4.80 PB 143 072

Through study of the effects of ionizing radiation, fundamental information has been gained about the biology of normal and neoplastic cells and about the process of neoplasia. A variety of disturbances have been observed in irradiated cells, including alterations in metabolism, growth, and differentiation, but existing evidence suggests that the most significant primary action of radiation is on the genetic apparatus of the cell. That radiation-induced genetic effects may initiate tumor formation is highly conceivable; however, some other mechanism seems to be involved in certain instances of radiation carcinogenesis. Whatever the mechanism, the development of malignancy appears to be a complex, multistage process. The material basis for the large variation in radiosensitivity that exists among cells of different types is still poorly understood; however, with increasing knowledge of the mode of action of radiation and of the factors influencing the radiosensitivity of the cell, ways are being found to increase, decrease, and repair radiation injury. These advances hold promise of providing means of enhancing the effectiveness of radiotherapy in the treatment of cancer and of reducing the hazard of radiation as a carcinogenic agent.

School of Aviation Medicine, Randolph AFB, Tex.
USING Co^{60} TO DETERMINE THE $LD_{50/30}$ FOR THE RAT, by Robert E. Tatsch, John C. Tourville, and Loren C. Logie. Apr 57, 3p. 4 refs. Rept. 57-89; AD-136 187.
Order from LC mi$1.80, ph$1.80 PB 129 388

When Co^{60} was used at a dose rate of 500 r/minute, an $LD_{50/30}$ of approximatley 950 r was found for female Sprague-Dawley rats. Two methods of analysis were used to determine the $LD_{50/30}$. Results were compared with those of other experiments using 250 kv. p. x-rays.

Uppsala U. (Sweden).
RESEARCH ON LOCALIZED RADIO-LESIONS, PART II. EFFECT OF HIGH ENERGY PROTONS ON THE BRAIN OF THE RABBIT, by Bror Rexed, William Mair and others. Technical rept. no. 1, App. 4 on Contract AF 61(514)1247. 1 May 59, 18p. 7 refs. AFOSR-TN-59-976.
Order from LC mi$2.40, ph$3.30 PB 143 586

The present report deals with the effect of high energy protons on the brain of rabbits. One of the reasons for this investigation was the possible application of high energy heavy particles to stereotaxic radiosurgery in man: It is therefore essential to know their effect on the central nervous system. Irradiated brains were examined histopathologically, up to about one year after irradiation. There was destruction of nerve cells, myelin sheaths and axons. Thick walled capillaries, small perivascular haemorrhages and macrophages appeared in the early stages of the lesion. There was proliferation of astrocytes. Astrocytes with nuclei three or four times the normal size appeared at 4 weeks and subsequently giant cells with one or more nuclei were frequently seen but always within the irradiated region. No large haemorrhages were ever seen. The need for studies on the central nervous system at much later periods after irradiation is stressed.

CHEMISTRY

Massachusetts Inst. of Tech., Cambridge.
HYDROGEN PEROXIDE LABORATORIES, by W. C. Schumb and C. N. Satterfield. Quarterly periodic Status rept. on Contract Nonr-1841(11). 31 Mar 58, 15p.
Order from LC mi$2.40, ph$3.30 PB 138 605

Contents:
Stability studies
High pressure ignition limits of hydrogen peroxide vapor
Heterogeneous catalysis in liquid hydrogen peroxide
Hydrogen peroxide decomposition flame
Heterogeneous catalysis of hydrogen peroxide vapor

Uppsala U. (Sweden).
ADDITION COMPOUNDS OF ANTIMONY CHLORIDES WITH SULFOXIDES AND SULFONES, by Ingvar Lindqvist. Technical note no. 1 on Contract AF 61(052)43. 20 Oct 58, 11p. 6 refs. AFOSR TN-59-116; AD-210 421.
Order from LC mi$2.40, ph$3.30 PB 138 712

The liquidus curves have been studied for the systems $SbCl_5$-$SO(CH_3)_2$, $SbCl_5$-$SO_2(CH_3)_2$, $SbCl_3$-$SO(CH_3)_2$ and $SbCl_3$-$SO_2(CH_3)_2$. The following new compounds have been prepared: $SbCl_5 . SO(CH_3)_2$, $SbCl_5 . SO(C_6H_5)_2$, $SbCl_5 . SO_2(CH_3)_2$, $SbCl_5 . SO_2(C_6H_5)_2$, $SbCl_3 . SO(CH_3)_2$ and $SbCl_3 . SO_2(CH_3)_2$. The melting point relations between these compounds have been discussed.

Analytical Chemistry

Fowles, G. W. A.
A STUDY OF THE CHEMICAL PROPERTIES OF THE COMPLEX NITROGEN, PHOSPHORUS, OXYGEN AND SULPHUR COMPOUNDS OF THE TITANIUM, VANADIUM AND CHROMIUM SUB-GROUP METALS, by G. W. A. Fowles. Annual rept. no. 1, 1 Apr 58-1 Apr 59, on Contract DA 91-508-EUC-307. [1959] 12p.
Order from LC mi$2.40, ph$3.30 PB 143 110

New York U. Coll. of Engineering, N. Y.
THERMAL ANALYSIS IN THE SYSTEM MAGNESIUM CHLORIDE-$TiCl_x$, by K. Komarek and P. Herasymenko. Technical rept. no. 3 on Thermodynamic Properties of Titanium Halides in Molten Salt Systems, Contract Nonr-285(13). Oct 56, 17p.
Order from LC mi$2.40, ph$3.30 PB 130 016

Thermal analysis of the mixtures of magnesium chloride and titanium chlorides fused in specially designed titanium metal crucibles was made in the range from 0 to 100 wt% $TiCl_x$. Chemical analyses of the solidified samples show that titanium dichloride is the prevalent species. The ratio, $\%TiCl_2/\%TiCl_3$ is fairly constant at all contents of magnesium chloride and is equal to about 7.7. Magnesium-chloride-free $TiCl_x$ has a melting point of 1025°C. The salt produced by fusion and solidification appears to be chemically less reactive than titanium dichloride obtained by disproportionation of solid titanium trichloride. The phase diagram of the system $MgCl_2$ - $TiCl_x$ derived from these measurements is of the peritectic type. The peritectic point lies close to the $MgCl_2$-side at about 0.35% $TiCl_x$. The peritectic temperature is 716°C. The solid solubility of $TiCl_x$ in $MgCl_2$ at the peritectic temperature is about 0.35% $TiCl_x$. The possibility is not excluded that the fused salt contains titanium di- and monochloride and that trichloride forms on cooling by disproportionation of monochloride. However, special experiments will be needed to prove or disprove the possibility of formation of monochloride.

Physical Metallurgy Lab., Calif. Inst. of Tech., Pasadena.
THE RESOLUTION OF ELECTRON PROBE MICROANALYZERS, by David B. Wittry. Technical rept. no. 8 on Contract N6onr-24430. Mar 58, 29p. 20 refs.
Order from LC mi$2.70, ph$4.80 PB 139 161

Organic Chemistry

California U., Los Angeles.
CHEMISTRY OF ALLENIC COMPOUNDS, by Thomas L. Jacobs and Ronald S. Bauer (Doctoral thesis). Technical rept. on Contract DA 04-495-ORD-527. June 58, 92p. 87 refs. AD-137 095.
Order from LC mi$5.40, ph$15.30 PB 142 948

This investigation was concerned with the synthesis and polymerization of allenes of the type $X_2C\ C\ CX_2$. Of particular interest in this study was the preparation of tetrafluoroallene and the polymer derived from it. Under autogenous pressure at room temperature tetrafluoroallene polymerizes to a white insoluble solid. An X-ray diffraction study of the polymer indicated that the material was a highly crystalline linear polymer. The polymerization is believed to occur by a free radical mechanism. Chlorotrifluoroallene was obtained from the reaction of 3-bromo-1, 1-dichloro-1, 3, 3-trifluoropropane with powdered potassium hydroxide.

Instituto de Quimica Fisica (Spain).
THERMOCHEMICAL INVESTIGATIONS ON METHYL-SUBSTITUTED BENZOIC ACIDS, by M. Colomina, R. Perez Ossorio and others. Final technical rept. for 1 July 58-30 June 59 on Contract DA 91-508-EUC-358. [1959] 41p. 30 refs.
Order from LC mi$3.30, ph$7.80 PB 143 450

The full series of the methylsubstituted benzoic acids includes three mono-, six di-, six tri- three tetra-, and one pentamethylbenzoic acids. This report contains the thermochemical data for the first nine members of this series: the three toluic acids and the six dimethylbenzoic acids.

Kansas U., Lawrence.
ANODIC REDUCTIONS. V. THE REDUCTION OF DIKETONES BY UNIPOSITIVE MAGNESIUM ANODICALLY GENERATED, by William D. Hoffman, William E. McEwen, and Jacob Kleinberg. Technical rept. no. 9, 15 Oct 57-1 Aug 58, on Reduction of Organic Compounds by Lower Valent Species of Active Metals, Contract DA 23-072-ORD-1048. [1958] 21p. 27 refs. AD-203 798.
Order from LC mi$2.70, ph$4.80 PB 138 216

A series of diketones of the general formula $C_6H_5CO(CH_2)_nCOC_6H_5$ has been prepared and subjected to "anodic reduction" in sodium iodide-pyridine solution between magnesium electrodes. In every case hydrolysis of the anolyte following electrolysis yielded a 1, 2-diol as the reduction product, 1, 3-dibenzoylpropane (n = 3) and 1, 4-dibenzoylbutane (n = 4), gave cis-1, 2-diphenylcyclopentane-1, 2-diol and cis-1, 2-diphenylcyclohexane-1, 2-diol, respectively. There is a striking correlation between the initial mean valence number ($\underline{V}_i$) of the magnesium entering solution from the anode and the size of the ring; the lowest $\underline{V}_i$ values were obtained in those instances where the diketones originally in solution gave the most stable cyclic diols. Interpretations are offered for these results and for corrosion phenomena observed. (See also 140 946)

Massachusetts Inst. of Tech., Cambridge.
HYDROGEN PEROXIDE LABORATORIES, by R. L. Wentworth. Quarterly periodic status rept. on Contract Nonr-1841(11). 31 Dec 56, 15p.

AD-122 932.
Order from LC mi$2.40, ph$3.30 PB 130 592

Contents:
Stability of hydrogen peroxide:
The effect of aluminum upon stability with tin
Stability measurements on shell hydrogen peroxide
Flame velocities in hydrogen peroxide vapor
Supercooling of liquid hydrogen peroxide
High pressure ignition limits of hydrogen peroxide vapor
Rate of solution of iron from stainless steel immersed in hydrogen peroxide
Literature dealing with hydrogen peroxide
Visitors
(See also PB 128 573)

New Hampshire U., Durham.
ELECTROPHILIC DISPLACEMENT REACTIONS INVOLVING ORGANOBORON COMPOUNDS, by H. G. Kuivila. Final rept. on Contract Nonr-806(01). 1 Dec 56, 7p. 10 refs.
Order from LC mi$1.80, ph$1.80 PB 130 566

This final report is presented in the form of a summary of the results obtained and conclusions drawn in the course of the research. References to more detailed reports or publications are given. Substantial progress has been made in revealing characteristics of electrophilic aromatic displacements involving organoboron compounds. The existence of linear correlations of the Hammett equation type among aromatic electrophilic displacements is indicated. It is shown that chelating agents play specific roles in catalyzing the reactions of areneboronic acids.

Texas U., Austin.
INTERACTIONS OF ACETYLENE AND AROMATIC HYDROCARBONS, by R. C. Anderson and Rita S. Wallace. Technical note no. 5 on Contract AF 18(603)142. June 59, 15p. 2 refs. AFOSR-TN-59-611; AD-217 398.
Order from LC mi$2.40, ph$3.30 PB 143 298

The earlier experiments of Stehling on thermal reactions of mixtures of acetylene with aromatic hydrocarbons have been extended to styrene-acetylene mixtures at temperatures of 600-800°C. The data are limited because of the high rate of polymerization of styrene, but they do offer a useful comparison with other hydrocarbon systems because styrene is a very reactive aromatic compound. Styrene was found to be quite reactive in polymerization even in gas phase at low pressure; but, like the other aromatic hydrocarbons it showed little decomposition up to 800°. With acetylene present, small amounts of addition products were observed; but the chief effects with all the hydrocarbons tested were enhanced production of decomposition products such as hydrogen and methane. The results indicate that acetylene supplies an activated molecule or diradical which can react so as to open or split the aromatic ring structure.

Washington U. [Seattle].
PREPARATION AND PROPERTIES OF PENTAFLUOROSELENIUM HYPOFLUORITE (F_5SeOF) AND BIS(PENTAFLUOROSELENIUM) PEROXIDE ($F_5SeOOSeF_5$) by Grihapati Mitra and George H. Cady. Technical rept. no. 20 on Contract Nonr-477(16). [1958] 12p. 12 refs.
Order from LC mi$2.40, ph$3.30 PB 143 244

The fluorination of selenium dioxide and of selenium oxychloride has been found to give rather small yields of the new compounds, pentafluoroselenium hypofluorite (F_5SeOF) and bis(pentafluoroselenium) perioxide ($F_5SeOOSeF_5$). The former is highly reactive. It boils at about -29° and melts at about -54°. The latter is relatively inert chemically. It melts at -62.8° and boils at 76.3°.

Physical Chemistry

Aberdeen Proving Ground, Md.
A STUDY OF THE MICELLAR SIZE OF AN ANIONIC-NONIONIC SURFACTANT COMBINATION, by A. Mankowich and C. F. Pickett. Progress rept. no. 11 on Investigation of Synthetic Detergents, Ordnance Proj. TB4-821E. 11 June 56, 18p. 10 refs. Engineering Labs. rept. no. 46.
Order from LC mi$2.40, ph$3.30 PB 138 948

To investigate by the light scattering technique the micellar size of the anionic-nonionic surfactant combination of sodium dodecylene benzene sulphonate and iso-octyl phenyl nonaethylene glycol ether (SDBS and IOPG, respectively) in aqueous solution. To evaluate the micellar size data from the standpoint of the known detergent synergism of the surfactant combination, as part of the program for developing a scientific method of selection of surfactants for specific detergent applications.

Amherst Coll., Mass.
THERMODYNAMIC PROPERTIES OF THE ELECTRICAL DOUBLE LAYER; SEARCH FOR SPECIFIC ADSORPTION OF CESIUM IONS IN THE ABSENCE OF SPECIFICALLY ADSORBED ANIONS, by F. R. M. Deane, A. E. Higinbotham, and D. C. Grahame. Technical rept. no. 7, second series, on Contract Nonr-2309(01). 14 Nov 58, 32p. 9 refs.
Order from LC mi$3.00, ph$6.30 PB 143 476

Three lines of evidence are presented tending to show that the cesium ion is not specifically adsorbed on mercury in the absence of specifically adsorbed anions. The potential of the e.c. max. in solutions of cesium fluoride is found to be constant at a value of 0.475 ± 0.003 v. relative to a normal calomel electrode. The behavior of the capacity of the double layer is normal in that it can be predicted almost quantitatively by a theory which assumes the absence of specific adsorption of both cations and anions and simple dependence of the capacity of the inner region

upon the surface charge density, q, and not upon the concentration of the electrolyte. The slight dependence of the capacity of the inner region of the double layer upon the identity of the associated cation found by Damaskin, Nikolaeva-Fedorovich and Frumkin is confirmed but is explained in a manner which does not require their postulate of specific adsorption of cesium ions on positively charged mercury.

Applied Physics Lab., Johns Hopkins U., Silver Spring, Md.
THE COMBUSTION OF BORON HYDRIDES, by W. G. Berl and W. Renich. Rept. on Contract NOrd-7386. July 58, 60p. 57 refs. CM-942; AD-207 027.
Order from LC mi$3.60, ph$9.30 PB 143 542

This report reviews the currently available information on the combustion of boron hydrides. A number of the more important combustion properties are listed, and the available published information is indicated by references. Although many of the pertinent physical combustion constants (flame speeds, heat release rates, etc.) are now being measured, the understanding of the underlying chemical reactions and mechanisms is still very limited. Likewise, the high temperature equilibria in the B-H-O-C system are far from satisfactorily explored, primarily because of the lack of definitive thermochemical data. In contrast to the C-H-O-N system, many more species (polymers, hydrates) are potentially stable at elevated temperatures and need to be considered.

Delaware U., Newark.
OPTICAL STUDIES OF THE STRUCTURE OF TURBULENT FLAMES, by Kurt Wohl and Rajah H. Atalla. Rept. on Contract Nonr-1858(25). Apr 58, 22p. 16 refs. Proj. Squid Technical rept. DEL-11-P.
Order from LC mi$2.70, ph$4.80 PB 142 956

Electrochemical Research Lab., Western Reserve U., Cleveland, Ohio.
THE ANODIC AND CATHODIC PROPERTIES OF THE CHLORINE ELECTRODE, by John Aylward, Ernest Yeager, and Frank Hovorka. Technical rept. no. 8 on Contract Nonr-581(00). 1 Feb 58, 58p. 23 refs.
Order from LC mi$3.60, ph$9.30 PB 138 779

The present investigation represents an attempt to obtain basic information concerning the chlorine electrode through the study of the anodic as well as the cathodic properties of the electrode. The anodic and cathodic polarization associated with the chlorine electrode has been measured on platinum, graphite, and carbon in concentrated hydrochloric acid and sodium chloride solutions.

Harvard U., Cambridge, Mass.
CHARACTERIZATION OF CELLULOSE AND POLYPEPTIDE POLYMERS, by Paul Doty. Final rept. for 1 June 52-31 Aug 56 on Contract N5ori-07654. 21 Oct 57, 6p. 19 refs.
Order from LC mi$1.80, ph$1.80 PB 138 885

The research is covered in 16 reports and 19 published papers. The latter are cited in this final report together with summaries of the findings.

Institute for Cooperative Research, Johns Hopkins U., Baltimore, Md.
QUARTERLY TECHNICAL STATUS REPORT NO. 14, by H. E. Hoelscher, Eric Weger, and W. C. Bastian. Rept. on Contract AF 18(600)1176. 12 Dec 57, 19p. 5 refs.
Order from LC mi$2.40, ph$3.30 PB 139 009

Contents:
Part 1. Flame studies in a flat flame burner, by William T. Biedler, III and H. E. Hoelscher
Part 2. Bunsen flame studies, by Eric Weger and Duane Levine
Part 3. Theoretical investigation of the flat flame, by W. C. Bastian

Istituto di Chimica Generale dell'Università, Palermo (Italy).
THERMODYNAMICS OF THE EQUILIBRIA BETWEEN Ni(DBH) AND ALKYL-AMINES AND -PHOSPHINES IN BENZENE, by Luigi Sacconi. Final technical rept. no. 1 on Contract DA 91-508-EUC-304. 30 Apr 59, 35p. 27 refs. AD-217 434.
Order from LC mi$3.00, ph$6.30 PB 143 050

Louisiana State U., Baton Rouge.
ADSORPTION KINETICS AND ELECTRODE PROCESSES, by Paul Delahay and Isaac Trachtenberg. Rept. no. 25 (Technical) on [Contract Nonr-300(00)]. Oct 56, 35p. 42 refs.
Order from LC mi$3.00, ph$6.30 PB 130 014

The kinetics of adsorption on electrodes is studied for substances which are not reduced or oxidized at the electrode. Adsorption rates are derived for the plane electrode with control by semi-infinite linear diffusion, the streaming mercury electrode, and electrodes in stirred solution. Adsorption at the dropping mercury electrode is also considered briefly. Implications are discussed for double layer capacity measurements, electrocapillary curves studies, electrochemical kinetics, and polarography. Experimental methods are discussed, and a simple and accurate bridge for differential capacity measurements without insulation transformer is described.

Metallic Surfaces Research Labs., Ltd., Uxbridge (Gt. Brit.).
THE EFFECT OF HIGH FREQUENCY HEATING ON THE DIFFUSION PROPERTIES OF ONE METAL INTO ANOTHER, by R. L. Samuel and J. D. Samuel. Annual technical rept. ATR 1, 1 Apr 58-1 Apr 59, on Contract DA 91-508-EUC-310. 10 Apr 59, 35p. AD-214 791.
Order from LC mi$3.00, ph$6.30 PB 143 291

Several methods have been devised for chromising under conditions of H.F. heating. (1) The active chromising agent is chromium fluoride contained in the melted flux. (2) The chromising agent is chro-

mium bromide, generated from chromium powder and ammonium bromide. (3) The test-pieces are electroplated with chromium (0.004") followed by nickel (0.004"). The adherence of the chromium is good, but the nickel, the purpose of which is to protect the chromium, exfoliates badly, and sometimes alloying of nickel and chromium occurs as an alternative to the chromising reaction. Uniform coatings, of normal structure, have an average chromium content of 23 - 27%. Graphs have been constructed from data obtained by the three methods, showing variation of coating thickness with time at various temperatures.

Michigan U., Ann Arbor.
THE CHEMISTRY OF BORON HYDRIDES AND RELATED HYDRIDES, by R. W. Parry, R. C. Taylor and others. Rept. on Contract AF 33(616)3343. May 59, 192p. 140 refs. WADC Technical rept. 59-207.
Order from OTS $3.00 PB 161 080

A microcrystalline form of $B_2H_6 \cdot 2NH_3$ has been obtained and the powder pattern is tabulated for ready compound identification. Relatively strong evidence against the structure $[HB(NH_3)_3](BH_4)_2$ has been accumulated. The so-called "diammoniate of diborane II" which was formerly assigned this structure has been shown to consist chiefly of the regular "diammoniate" with the structure $[H_2B(NH_3)_2]BH_4$. Improved methods for the synthesis of pure salts of the form $[H_2B(NH_3)_2]X$ have been developed. A complete single-crystal X-ray crystallographic study which established the structure of $[H_2B(NH_3)_2]Cl$ has been completed and the data confirm the above structure assignments in every detail. A nuclear magnetic resonance study of $[HB(NH_3)_2]I$ can best be interpreted in terms of the accepted structure of the cation $[H_2B(NH_3)_2]^+$. The "diammoniate of diborane," $[H_2B(NH_3)_2]BH_4$, has been prepared by metathesis, a fact which offers final and complete chemical support for the above structure. (See also PB 133 981)

Naval Radiological Defense Lab., San Francisco, Calif.
AN APPARATUS FOR THE CONTROLLED FLAME COMBUSTION OF FILTER PAPER, by M. Honma and A. E. Greendale. 20 Oct 58, 10p. 2 refs. Research and development rept. USNDRL-TR-285.
Order from LC mi$1.80, ph$1.80 PB 143 894

A new apparatus and technique is described for the controlled flame combustion of filter paper and cloth. The sample is burned in an atmosphere of oxygen at a reduced pressure within a pyrex glass cylinder. A detailed description is given of the operation of the apparatus. The numerous advantages of this system over previous methods are enumerated. The apparatus can be scaled up or down in size and can also be used with gases other than oxygen. Since it is possible to contain completely the sample during the combustion and to collect the products of combustion, it appears to be an extremely efficient system for quantitative determinations and for use with radioactive materials and toxic chemicals.

Northwestern U., Evanston, Ill.
THE STRUCTURE AND ACTIVITY OF CATALYTICALLY ACTIVE SOLIDS, by P. W. Selwood. Final rept. on Contract N7onr-45003. 1 Aug 56, 5p. 26 refs.
Order from LC mi$1.80, ph$1.80 PB 128 262

Brief summary of work on (1) The structure of supported catalytic oxides as deduced from magnetic susceptibility studies. (2) The use of nuclear magnetic resonance in the study of catalyst surfaces. (3) The mechanism of chemisorption. (See also PB 123 224)

Ohio State U. Research Foundation, Columbus.
ADIABATIC FLAME TEMPERATURES, COMBUSTION GAS COMPOSITIONS, AND EXPANSION RATIOS OF COMBUSTIBLE MIXTURES AT VARIOUS PRESSURES, by William A. Strauss and Rudolph Edse. Rept. on Contract AF 33(616)2833. July 59, 51p. 2 refs. WADC Technical note 59-49.
Order from OTS $1.50 PB 161 077

This paper contains calculations of adiabatic flame temperature, expansion ratio, and combustion gas composition expressed in partial pressures for hydrogen-oxygen, hydrogen-air, hydrogen - nitric oxide, carbon monoxide - oxygen, carbon monoxide - air, methane-oxygen, methane-air, ammonia-oxygen, ammonia-air, hydrogen-bromine, and cyanoaen-air mixtures at pressures from 1 to 90 atmospheres. Flame temperatures and expansion ratios increase at a decreasing rate as the pressure is increased. The oxygen and nitric oxide flames have a high flame temperature and show the largest change as the pressure is raised.

Rensselaer Polytechnic Inst., Troy, N. Y.
A RECORDING BECKMAN THERMOMETER AND DIFFERENTIAL POTENTIOMETER, by C. Solomons and George J. Janz. Technical note no. 3 on Contract AF 49(638)50. Aug 57, 13p. AFOSR TN-57-497; AD-136 487.
Order from LC mi$2.40, ph$3.30 PB 129 942

An apparatus is described by means of which accurate measurements and records of changing electromotive forces can be made. The apparatus is normally used to measure and record changes of temperature of 1 to 5°C. The principle of operation is such that small differences in emf. between a test source such as a thermocouple and a standard source such as a potentiometer is amplified by means of a stable dc microvolt amplifier. A continuous-balance stripchart potentiometer recorder is used with the device.

Stanford Research Inst., Menlo Park, Calif.
DIFFUSION AND HETEROGENEOUS REACTION. I. THE DYNAMICS OF RADICAL REACTIONS, by Henry Wise and Clarence M. Ablow. Rept. on Project Squid, Contract Nonr-1858(25). Mar 58, 18p. 13 refs. Technical rept. SRI-1-P. AD-156 508.
Order from LC mi$2.40, ph$3.30 PB 139 187

The diffusion and heterogeneous reaction of labile species in a cylinder of finite length are examined. The effects of radial and longitudinal diffusion are included in the mathematical treatment. The results of this analysis are applied to published data of the recombination coefficients of oxygen and hydrogen atoms on the surfaces of various materials.

Sterling Chemistry Lab., Yale U., New Haven, Conn.
NUMERICAL CALCULATION OF THE ONSAGER-KIM THEORY USING AN ELECTRONIC COMPUTER, by Andrew Patterson, Jr. and Harlow Freitag. Technical rept. no. 4 on High Field Conductance Research, Contract Nonr-215(00). 15 May 58, 39p. 5 refs.
Order from LC mi$3.00, ph$6.30 PB 139 063

A program for calculating the Wien Effect for any binary strong electrolyte is given. The program is based on the Onsager-Kim theory of the Wien Effect, and is suitable for use on the IBM 650 data-processing machine. A brief exposition on the use of the machine is given, together with the method of programming used in this paper. A description of how the theory was translated is included, plus a computers' check-list, allowing use of the program without the necessity of previous programming experience.

Texas U., Austin.
CAPACITY OF THE ELECTRICAL DOUBLE LAYER AND ADSORPTION AT POLARIZED PLATINUM ELECTRODES, by Norman Hackerman and Pranjivan V. Popat. Technical rept. on Contract Nonr-375(02). 15 Mar 58, 31p. 25 refs.
Order from LC mi$3.00, ph$6.30 PB 139 197

The differential capacity of the electrical double layer at polarized platinum electrodes has been investigated as a function of the type and concentration of anions.

Vitro Labs., West Orange, N. J.
VAPOR PHASE CARBOTHERMIC REDUCTION OF MAGNESIUM OXIDE IN THE HIGH INTENSITY ARC, by S. Korman, A. Diniak, and C. Sheer. Technical note no. 6 on Contract AF 18(603)03. 22 Aug 58, 15p. 8 refs. KLX-10116; AFOSR-TN-58-498; AD-158 308.
Order from LC mi$2.40, ph$3.30 PB 143 656

A laboratory investigation of the vapor-phase reduction of magnesium oxide has been carried out in the tail flame of a d-c high intensity arc. Thermodynamic considerations were used to predict an approximate temperature-dependence for the homogeneous reaction, $MgO + C \rightarrow Mg + CO$, indicating this reaction goes to completion above 1800°C. Since the lowest recorded temperature in the flame was $\sim$ 2000°C, it was assumed that the flame consisted predominantly of reaction products. This was verified by spectrographic observation. It was concluded that the reaction was a homogeneous one and that the high intensity arc technique offers interesting possibilities in the carbothermic reduction of stable metal oxides.

EARTH SCIENCES

Lamont Geological Observatory, Palisades, N. Y.
FINAL REPORT, by Paul W. Pomeroy. Rept. on Contract AF 19(604)1369. 9 Dec 58, 13p. 31 refs. CU-13-58-AF1369-GEOL; AFCRC-TR-58-292.
Order from LC mi$2.40, ph$3.30 PB 138 716

Development of the mathematical theory of normal mode propagation in stratified elastic media; experimental investigation by means of small scale models of naturally occurring wave guides; applications of the methods developed to the interpretation of seismological, acoustic and microbarometric data in terms of the dimensions and physical properties of the medium and the location and nature of the source.

Climatology and Meteorology

Air Force Cambridge Research Center, Bedford, Mass.
PROJECT PRAIRIE GRASS, A FIELD PROGRAM IN DIFFUSION, VOLUME III, by Duane A. Haugen. June 59, 686p. 1 ref. Geophysical Research Papers no. 59; AFCRC-TR-58-235(III); AD-217 076.
Order from OTS $8.00 PB 161 101

Project Prairie Grass was a field program designed to provide experimental data on the diffusion of a tracer gas over a range of 800 meters. This, the third volume of the report on the project, contains descriptions of the fast-response instrumentation utilized for the measurement of wind fluctuations. The data reduction and analysis techniques are also presented along with tabulations of the results of the computations. (See also PB 151 424)

Allied Research Associates, Inc., Boston, Mass.
MODIFICATION OF FOG AND CLOUD PARTICLES IN THE ATMOSPHERE, by Robert B. Smith, Raymond Wexler, and Arnold H. Glaser. Final rept. Pt. 2, on Research Directed toward Contrail Elimination, Contract AF 19(604)3492. 31 Mar 59, 56p. 7 refs. AFCRC-TR-59-228, Pt. 2; AD-212 553.
Order from LC mi$3.60, ph$9.30 PB 143 200

Part II of the report deals with aspects of artificial fog and cloud modification. A number of studies and experiments on dry-ice crushing and disseminating equipment led to a suggested improved design. The possibility of the reduction or suppression of fogs by the use of hexadecanol to prevent evaporation from nearby free water surfaces is discussed. Evaporation of some fog and small clouds through the absorption of sunlight by pollutants added to the cloud seems possible on the basis of calculations of the effect of carbon black seeding, as well as more general theoretical considerations. (See also PB 143 201)

Allied Research Associates, Inc., Boston, Mass.
RESEARCH IN RADAR METEOROLOGY, by Roland J. Boucher and Raymond Wexler. Final rept., Pt. 3, 1 May-31 Nov 58, on Contrail Elimination, Contract AF 19(604)3492. 20 Mar 59, 15p. 3 refs. AFCRC-TR-59-228, Pt. 3; [AD-220 568].
Order from LC mi$2.40, ph$3.30 PB 143 543

A comparatively new technique for displaying precipitation echoes on radar, the Constant Altitude Plan Position Indicator display (CAPPI), is critically reviewed as to its possibilities as a research tool and as a means of presenting radar information for synoptic diagnosis and forecasting. Radar echo patterns along the vertical which indicate rapid changes in the wind profile aloft may be of significant use in forecasting weather conditions up to 12 hours. Radar detection of echoes associated with the sea breeze at Round Hill reveals some interesting micrometeorological aspects of the sea breeze. Research on the melting of hail indicates that along the 20°C wet adiabat hail of about 1 cm diameter at the 4 km level will completely melt by the time it reaches the surface.

Allied Research Associates, Inc., Boston, Mass.
A TEST OF THE FEASIBILITY OF THE USE OF JET ENGINE EXHAUST HEAT FOR FOG DISSIPATION, by Robert B. Smith and Raymond Wexler. Final rept. Pt. 1 on Research Directed toward Contrail Elimination, Contract AF 19(604)3492. 31 Mar 59, 27p. 4 refs. AFCRC-TR-59-228 Pt. 1; AD-212 553.
Order from LC mi$2.70, ph$4.80 PB 143 201

Measurements of temperature and wind speed in the exhaust plume of a jet aircraft operating on the ground were made to investigate the feasibility of the use of jet engine exhaust heat to dissipate fog from airport runways. A field test in a calm showed that temperature rises of 2°F above ambient reached 200 ft above the runway over a width of 200 ft at distances of 300-600 ft behind the tail pipe. Maximum induced wind speeds in this region were about 20 mph. Based on the results of this experiment a fog dissipation technique for airport runways using jet exhaust heat seems feasible for fogs warmer than about 30°F.

Army Signal Radio Propagation Agency, Fort Monmouth, N. J.
FORECAST OF IONOSPHERIC STORMS AND RADIO COMMUNICATIONS 1959 - 1962, by Luther C. Kelley. June 58, 20p. Proj. no. 636.
Order from LC mi$2.40, ph$3.30 PB 143 137

This brochure is designed to forewarn supervisory and operating personnel of the Army Command and Administrative Network of increased radio circuit outage during the downward trend of the current sunspot cycle. Long-range predictions indicate that severe disruptions of radio service will result from ionospheric storms during this period. Data of actual circuit performance illustrate the curtailment of radio communication with rising geomagnetic activity. Long-term forecasts are based on the correlation of geomagnetic activity with sunspot number observed for many years. Recommendations for the reduction of outage are included.

Florida State U., Tallahassee.
AN INVESTIGATION OF THE COMBINED INFLUENCES OF LARGE-SCALE DIFFERENTIAL HEATING AND OROGRAPHIC OBSTACLES IN CREATING QUASI-PERMANENT FORCED PERTURBATIONS OF THE CIRCUMPOLAR WESTERLIES, by Charoen Vadhanapanich. Technical rept. no. 10 on Contract Nonr-1600(00). 15 Mar 58, 71p. 23 refs.
Order from LC mi$4.50, ph$12.30 PB 139 195

The present results suggest that the statistical mean perturbations are only partially a result of steady forcing influences, and must also be, in part, a result of "preferred" behavior, i.e. development and movement, of individual day-to-day perturbations, which in turn is related to the fixed forcing effects. Further work on the problem should abandon the steady state approach in favor of a time dependent model which incorporates both factors.

Free U. of Berlin (Germany).
SHORT-RANGE WEATHER PREDICTION TECHNIQUES BY SPECIFICATIONS OF THE WEATHER ACCORDING TO THE FORECASTED PRESSURE DISTRIBUTION, RESEARCH ON, by D. Just, K. Sieland and G. Polster. Final technical rept. on Contract AF 61(514)946. 30 Nov 57, 186p. AFCRC TR-58-227; AD-152 508.
Order from LC mi$8.40, ph$28.80 PB 138 882

In the present research the relationship of the occurrence of fair, cloudy and overcast sky, of fog, precipitation and cloud height $h \leq 3$ to the surface- and 500-mb. pressure pattern is investigated. For the period 1950 - 1957 daily synoptic data, the respective pressure distribution, wind direction and pressure change were entered into key punched cards for three German, three English, and three Russian stations. Evaluating these punched cards, the frequency of the occurrence of the above-mentioned classes of sky and weather condition in connexion with different parameters of the pressure distribution was determined and summarized in the form of tables. For each class the mean value of occurrence, expressed as percentage, was computed, while for each combination with the different parameters the departure from the mean occurrence was calculated. As a means to assess the capability of individual parameters to exercise an influence on the occurrence of a certain class, a so-called departure factor ΔM was introduced. The best results were obtained for the occurrence of precipitation and of fair skies. As to the parameters, the pressure distribution gives better results than the pressure change and the wind direction. Especially good values were obtained for isobar curvature, high, low and trough at the surface, for high in 500 mb., wind speed = 50 knots in 850 and 500 mb., as well as for larger amounts of 3- and 24-hr. pressure changes. It can be definitely stated that in general the pressure distribution and pressure change at the surface exercise a stronger influence on sky and weather conditions than does the 500-mb. level.

Massachusetts Inst. of Tech., Cambridge.
MEAN TEMPERATURE FROM 1000 MB TO 500 MB AS A PREDICTOR OF PRECIPITATION TYPE, by A. James Wagner. Scientific rept. no. 2 on Contract AF 19(604)1305. May 57, 20p. 2 refs. AFCRC-TN-57-288; AD-117 176.
Order from LC mi$2.40, ph$3.30 PB 128 332

The frequency of occurrence of frozen precipitation forms relative to the frequency of occurrence of non-frozen forms is determined as a function of geographical location and of the mean temperature (or thickness) of the layer from 1000 mb to 500 mb. The results are derived from the data for a large number of stations in the United States during two winter seasons. A map of the thickness values for equal probability of occurrence of frozen and non-frozen forms illustrates the effects of altitude and continentality. It is found that the form of the precipitation can be specified with a confidence of 75% or more when the thickness value at a station is 100 feet or more from its "equal probability" value. Some refinements of the technique are discussed.

Naval Ordnance Test Station, China Lake, Calif.
AN INVESTIGATION OF RAWINSONDE DATA TECHNIQUES FOR COMPUTING WINDS ALOFT, by Royal C. Gould. 15 Sep 56, 23p. NOTS 1563; NAVORD rept. 5318.
Order from LC mi$2.70, ph$4.80 PB 130 430

A simplified and readily applicable technique, developed at the U. S. Naval Ordnance Test Station, for obtaining more accurate winds-aloft data based on Rawinsonde data is presented.

New York U. Coll. of Engineering, N. Y.
PROBABILISTIC DYNAMICS, by Max A. Woodbury. Rept. on Contract AF 19(604(3490. 30 Apr 59, 9p. AFCRC-TR-59-247; AD-216 319.
Order from LC mi$1.80, ph$1.80 PB 143 787

The model of the atmosphere provided by the Navier-Stokes equations of motions was greatly altered in application to weather forecasting by numerical means. The changes come about, partly at least, to remove from the model features of atmospheric motion which are irrelevant to the information available to the forecaster. Sound waves and other atmospheric motions which are small compared with the spacing between points at which data is available are eliminated from consideration. An avenue of approach is investigated which allows a unified viewpoint based on probabilistic notions rather than on a theory of approximation. A probabilistic dynamic system is characterized by a fairly rich structure compared with a dynamic system without probability elements, but much simpler in essence than many man-machine systems.

Pennsylvania State U. Mineral Industries Experiment Station, University Park.
PRELIMINARY MONTHLY MEAN 50 MB AND 100 MB CHARTS, APRIL-JULY, 1957, by Paul Julian. Scientific rept. no. 1 on Contract AF 19(604)2190. 31 July 59, 61p. 11 refs. AFCRC-TN-59-458.
Order from LC mi$3.90, ph$10.80 PB 143 591

Washington U., Seattle.
ARCTIC WEATHER STUDIES: SUMMER SEASON, by Richard J. Reed and Ronald K. Surface. Scientific rept. no. 5 on Contract AF 19(604)3063. June 59, 53p. 5 refs. AFCRC-TN-59-278; AD-214 889.
Order from LC mi$3.60, ph$9.30 PB 143 508

Aircraft reconnaissance reports and 3-hourly surface observations are used to study the relationship between various weather phenomena and features of the arctic circulation during a three-week period in July 1956. The reconnaissance reports were entered at appropriate positions on a large model containing surface fronts, 500-mb low center and 500-mb jet axis, and composites were drawn of average number of cloud layers, average total cloudiness, average cloudiness in the layers 0-5,000 feet, 5-10,000 feet, 10-15,000 feet, 15-20,000 feet and above 20,000 feet, and average winds and temperatures at 700 mb and 500 mb. The frequency of occurrence of turbulence and icing was also derived. The individual flight sections were studied in order to determine whether the middle and upper cloud masses were related to the frontal surfaces in the classical fashion. Turbulence was found to be very infrequent despite the above normal weather activity during the selected period. All reports of turbulence were made in or very near cloud layers. Icing was encountered in about one half of the cloud masses both at 700 mb and 500 mb. The frontal characteristics, as judged from the 3-hourly surface observations, were highly variable, and little attempt was made to generalize. (See also PB 139 559)

Washington U., Seattle.
AN ATTEMPT TO MEASURE THE WATER VAPOR DIVERGENCE OVER GREENLAND BY DIRECT APPLICATION OF RADIOSONDE DATA, by Richard Keith Wilson. Scientific rept. no. 3 on Contract AF 19(604)3063. May 59, 39p. 17 refs. AFCRC-TN-59-238; AD-211 111.
Order from LC mi$3.00, ph$6.30 PB 143 464

A resume of Greenland's geographical, topographical, and hydrological features is made to help evaluate the results of the computations of water vapor divergence. An equation suitable for the direct application of radiosonde data is developed from the equation of continuity and the divergence theorem. Six months of data were used in the computation of water vapor divergence. The months studied were: June, 1957; July, 1957; August, 1957; December, 1957; January, 1958; and February, 1958. The computations of water vapor divergence for Greenland through the direct application of radiosonde data are found to be unreliable. An investigation of the procedure used brings out three major factors which contribute to the unreliable values as mentioned above. These errors are: missing data, the condition known as motorboating, and the line integration technique which involves the assumption of linear variation of mean water vapor flux between stations. It was decided to prepare a series of daily 700-mb charts for December, 1957, to compare the water vapor divergence computations obtained by analyzed data to those obtained by the direct application of radiosonde data. The result suggests that meaningful information on the water vapor divergence of Greenland can be obtained from measurements taken from analyzed charts.

Washington U., Seattle.
RESULTS OF A SERIES OF DYNAMICAL PREDICTIONS FOR THE ARCTIC: SUMMER SEASON, by Richard J. Reed. Scientific rept. no. 4 on Contract AF 19(604)3063. Apr 59, 55p. 7 refs. Meteorology and Climatology Occasional rept. no. 12; AFCRC-TN-59-

246; AD-211 493.
Order from LC mi$3.60, ph$9.30 PB 143 509

Forecasts of 1000-mb and 500-mb heights were prepared for the arctic for a 20-day period in July, 1956. The forecasts were based on a two-level baroclinic model; solutions were obtained by both graphical and combined graphical and numerical integrations. The day-to-day performance of the method, as revealed by correlations between predicted and observed heights and root-mean square-errors, was slightly better than for a similar arctic series reported on by Estoque and somewhat worse than for comparable forecasts at middle latitudes. From the geographical distribution of correlations and errors, little evidence of important topographical influence was found. In general, the performance was best in regions where the synoptic activity was most pronounced. Generally speaking, the results confirm Estoque's conclusion that reasonably successful predictions should be possible in the arctic by dynamical methods once the data network is improved. Even with the present network, useful results are obtained on a considerable number of occasions.

Frost Science

American Geographical Society, New York.
GEOGRAPHIC STUDY OF MOUNTAIN GLACIATION IN THE NORTHERN HEMISPHERE. PART 4: NORTH ATLANTIC ISLANDS. Rept. on Contract DA 19-129-qm-409. Feb 58, 122p. 156 refs.
Order from LC mi$6.30, ph$19.80 PB 143 078

The North Atlantic Islands covered are: Greenland, Jan Mayen, Iceland, and Spitsbergen. (See also PB 143 079)

Bureau of Yards and Docks, Washington, D. C.
SNOW REMOVAL. 1 Oct 53, 60p. 7 refs. Technical pub. NAVDOCKS TP-Pw-29.
Order from OTS $1.50 PB 161 060

This publication has been prepared by the Bureau of Yards and Docks as a guide for naval and civilian personnel concerned with snow removal and snowdrift control operations. Presented herein are technical criteria and operational procedures to be used as a guide for snow and ice removal, and for snowdrift control operations to keep roads, airfields, and other areas open to traffic. Lists and illustrations of equipment are included, as well as detailed instructions concerning usage. Specific types of equipment best adapted for different snowfall areas are described.

North Pacific Div., Corps of Engineers, Portland, Oreg.
LYSIMETER STUDIES OF SNOW MELT. Research note no. 25 on Snow Investigations. 1 Mar 55, 61p. 16 refs.
Order from LC mi$3.90, ph$10.80 PB 128 397

Runoff from an unforested 600-square-foot snow-lysimeter area is used as a measure of snow-melt quantities. The component melts due to radiation, convection, and condensation are computed from measured meteorological parameters and compared with the gaged runoff. Radiation and condensation melts are independently determined, the former from radiometer measurements and the latter from special moisture-exchange experiments.

Geodesy

[Army] Engineer Research and Development Labs., Fort Belvoir, Va.
SHORAN PHOTOGRAMMETRIC MAPPING INSTRUCTIONS, by Archer M. Wilson. 15 May 50, declassified 5 Nov 53. 153p. Rept. 1168; supersedes rept. 1055.
Order from LC mi$7.50, ph$24.30 PB 127 704

This report is designed to provide a set of tentative operating instructions for use by Corps of Engineers personnel who may be required to employ Shoran-controlled photography in fulfilling current mapping assignments. The wording and layout have been written in the general form of a training manual so as to facilitate its later publication.

Rome Air Development Center, Griffiss AFB, N. Y.
ELECTRONIC COMPUTERS FOR RECONNAISSANCE FIELD UNITS, by Anthony A. Garra and Mary B. Erskine. June 59, 32p. RADC-TR-59-71; AD-215 440.
Order from LC mi$3.00, ph$6.30 PB 143 268

For several years the Air Force has been attempting to introduce automatic computational techniques and equipment to reconnaissance field units to speed up mathematical operations and reduce manpower requirements. This report describes the RADC development program to obtain a small reconnaissance computer to meet field requirements. The interim equipment procured and assigned to field units is described in detail. The equipment purchased to study programming techniques is also described. The experimental equipment designed specifically for field requirements is presented in detail and typical problems to be computed on the equipment are discussed. The effort to satisfy the operational requirement is about 80 percent complete. Several improvements to the computational equipment are recommended as a means of satisfying the existing requirement.

Stanford Research Inst., Menlo Park, Calif.
THE DETERMINATION OF THE EARTH'S POTENTIAL FIELD BY OBSERVATIONS OF SATELLITE ORBITS, WITH SPECIAL REFERENCE TO THE DETERMINATION OF THE THIRD HARMONIC, by J. L. Brenner, R. Fulton, and N. Sherman. Rept. on Contract AF 29(600)1773. 1 July 59, 39p. 4 refs. 2587-ITR-3; AFMDC-TR-59-29.
Order from LC mi$3.00, ph$6.30 PB 143 518

A theoretical analysis of the differential equations of motion of a near-earth satellite about a model earth having mass distribution which is symmetric with respect to its polar axis and its equatorial plane reveals that the satellite's orbit undergoes long-period changes not previously reported. Numerical integration of the equations of motion verifies this result. These changes are minute and definitely observable only if many observations are made during each revolution. On the other hand, a bias in the handling of the observations can override these changes, and introduce spurious secular (long-term) variations. The magnitudes and periods of typical spurious variations have been evaluated. The variation of the eccentricity agrees with that reported from the Vanguard computing center; hence its use in verifying the existence of a third harmonic in the earth's gravitational potential field is not justified.

Wharton School of Finance and Commerce, U. of Pennsylvania, Philadelphia.
ANALYSIS OF STEAD DISTRIBUTION BY THE D-LINE METHOD, by Arthur F. Loeben. Technical rept. no. 6 on Contract Nonr-551(01). 1 Oct 58, 39p. 14 refs.
Order from LC mi$3.00, ph$6.30 PB 143 798

In this paper, interest and effort has been placed on developing a method of finding and generalizing such patterns. An attempt is made to define a useful unit of enumeration and to generalize its distribution. The concept of the stead is used as the basic unit, and the concept of a nucleated area as the first level of generalization. Beyond this, further generalization and development of patterns is accomplished by using the D-line method of agglomeration. Some aspects of scale and theoretical distributions are examined and used. The end product of the research is presented as three levels of generalization of the same data with the resulting differences in their patterns.

Wharton School of Finance and Commerce, U. of Pennsylvania, Philadelphia.
DESCRIPTION OF A LAND-USE MAP OF PENNSYLVANIA, SCALE 1:250,000, by Lester E. Klimm. Technical rept. no. 2 on Contract Nonr-551(01). 1 Oct 58, 10p.
Order from LC mi$1.80, ph$1.80 PB 143 795.

Wharton School of Finance and Commerce, U. of Pennsylvania, Philadelphia.
THE DISTANCE RELATIONS AND SOME OTHER CHARACTERISTICS OF CROPLAND AREAS IN PENNSYLVANIA, by James P. Latham. Technical rept. no. 4 on Contract Nonr-551(01). 1 Oct 58, 274p. 53 refs.
Order from LC mi$11.10, ph$42.60 PB 143 800

The conclusions of this study fall into two general classes. The first class results from the general finding that it is possible by the D-line method of analysis to regionalize an areal dispersant of extreme complexity, e.g., cropland, according to distance relations and to derive regions that are objectively located and bounded. The second class develops from the measurement of uninterrupted surface distances (intercepts) along rotated parallel traverses. Such measurement provides quantitative data for describing characteristics of regions and of the areal dispersants within the regions.

Wharton School of Finance and Commerce, U. of Pennsylvania, Philadelphia.
MULTI-CATEGORY D-LINE ANALYSIS OF A DISTRIBUTION, by Lester E. Klimm. Technical rept. no. 5 on Contract Nonr-551(01). 1 Oct 58, 19p. 2 refs.
Order from LC mi$2.40, ph$3.30 PB 143 799

In previous papers the basic nature of the D-line method has been described and analyzed. There it was considered only as applied to the relations between patches of a single category of distribution--"islands," cropland areas, or "steads." Here it is proposed to examine its application to the analysis of the relations of two or more phenomena occurring within a complex landscape. For this purpose the section of The Land-Use Map of Pennsylvania showing the greatest complexity within a limited area was chosen. Its great complexity arises from the fact that it has small units of mining and urban use scattered through an area where the larger units of landscape are agricultural or in forest.

Wharton School of Finance and Commerce, U. of Pennsylvania, Philadelphia.
SOME CONTRIBUTIONS TO PRINCIPLES AND METHODS OF DESCRIPTIVE GENERALIZATION IN GEOGRAPHY, by Lester E. Klimm. Final rept. on Contract Nonr-551(01). 1 Oct 58, 18p. 9 refs.
Order from LC mi$2.40, ph$3.30 PB 143 704

A summation of work completed under the contract.

Geography

Columbia U., New York.
QUANTITATIVE GEOMORPHOLOGY OF SMALL DRAINAGE BASINS OF SOUTHERN INDIANA, by Donald R. Coates. Technical rept. no. 10 on Contract N6onr-271, T. O. 30. 1958, 65p. 18 refs. AD-206 780.
Order from LC mi$3.90, ph$10.80 PB 143 654

Morphometric analysis of six small areas in the unglaciated part of southern Indiana provided data for determination of influence of lithology, per cent of unconsumed upland (stage of cycle), and regional relief upon scale and form properties of third-order drainage basins measured in the field and from topographic maps and air photos. Ten drainage basins in each of six different localities were compared with respect to length dimensions of area, perimeter, overland flow, stream lengths, drainage density, and local relief, and with respect to dimensionless form properties of valley-side slopes, stream gradients, hypsometric curve forms and integrals, bifurcation ratios, length ratios, circularity, and azimuth relations of slope and

channels. Differences between areas were tested for significance by the analysis of variance.

Sacramento State Coll., Calif.
GEOGRAPHY OF INDIAN COASTS, by David E. Sopher. Annual summary rept. for 1957 on Contract Nonr-2329(00). [1958] 24p. AD-153 106.
Order from LC mi$2.70, ph$4.80 PB 137 992

A cultural geographic reconnaissance of the east coast of India was made during the summer of 1957. The itinerary included a traverse of the coast between the Bengal-Orissa boundary, northeast of Balasora, and Cape Gomorin. A short tract on the west coast north of the Cape to Trivandrum, an extension of the Tamil language area on the Malabar side, was included in the survey. Because relevant cultural variations were found to occur within relatively short distances along the coast, the number of coastal sites visited was large and the time spent at each necessarily brief. The cultural aspects of maritime traffic are described in terms of the use of Tuticorin dhoni and Kakinada nava country craft, trade in the country craft, conditions affecting country craft traffic, ports, and seafaring as a way of life. The use and distribution of the various types of Catamaran and other types of sea fishing craft are presented; a few notes were gathered on fishing gear and marine fish resource. Consumer habits and marketing of fish and other sea food are outlined. Sea fishing and seafaring is exclusively the province of a small number of castes, some of whom, while retaining their caste identity are Moslem or Christian rather than Hindu. A varying degree of cultural unconformity is noted and shown to exist between the strand fishing population and the rest of the coastal populations. An aspect of the marked social separation of the strand population from the much more numerous agricultural and urban population of the coastal plain is the existence of important Hindu shrines, some of great antiquity, on the shores of the Bay of Bengal.

Oceanography

Bureau of Yards and Docks, Washington, D. C.
MARINE BORERS AND FOULING ORGANISMS IN 56 IMPORTANT HARBORS [AND] TABULAR SUMMARIES OF MARINE BORER DATA FROM 160 WIDESPREAD LOCATIONS. Apr 51, 324p. 26 refs. NAVDOCKS TP-Re-1.
Order from OTS $3.50 PB 161 061

PART A of this report comprises a narrative analysis of the data from each of the 56 harbors. These locations are widely distributed along our Atlantic and Gulf coasts; in Canada and Alaska; in various Caribbean islands; in Brazil, North Africa, Sicily, and Italy; and in the Pacific as far as Australia and New Zealand. Each analysis identifies the marine borers which attacked the test boards at a given station, summarizes the intensity of borer attack, and describes the kind and number of fouling organisms present. The depth of the test board and various hydrographic data also are reported. Additional data for 1948 and 1949, where available, are summarized under the heading "Recent Addenda." PART B is a tabular summary of test board data recorded during 1934-1942 at several hundred locations. The majority of these locations are in the Middle Atlantic harbors; the others are scattered along the South Atlantic and Gulf ports in the Caribbean islands; in Venezuela and Brazil; in Italy; along the Pacific coast southerly from Adak, Alaska; and in the Hawaiian and other Pacific islands, Australia, and New Zealand.

Florida State U., Tallahassee.
A SIMPLIFIED THEORY OF LONG WAVES ON A BAROCLINIC WESTERLY CURRENT, by Seymour L. Hess. Technical rept. no. 11 on Contract Nonr-1600(00). 1 May 58, 24p. 6 refs.
Order from LC mi$2.70, ph$4.80 PB 138 818

A simplified, quasi-geostrophic, baroclinic theory of long waves is presented. By elimination of the geopotential from the divergence equation it is possible to relate the three velocity components by three independent equations. No more are needed. Simple solutions are obtained at the price of losing instability of the waves. The vertical motion ties the waves together vertically. The relationship of vertical motion to the profile of the zonal wind is examined. Possible extensions to long-range forecasting are discussed.

Johnson, J. W., and Wiegel, R. L., Berkeley, Calif.
WAVES AT SUBIC BAY, PHILIPPINE ISLANDS, by J. W. Johnson and R. L. Wiegel. Rept. on Study to Determine Effect of Grande Island Breakwater upon Destructive Wave Action during Normal Storms in Subic Bay, P. I., Contract NOy-79349. 1 Dec 55, 96p. 9 refs.
Order from LC mi$5.40, ph$15.30 PB 130 022

A critical examination of all available wave data shows that both the monsoons and the typhoons in the South China Sea are responsible for high wave conditions at the entrance of Subic Bay. To aid in future planning operations and designing structures that are affected by wave action the complete analysis of wave conditions at Subic Bay, as determined by hindcasts from past weather charts of the South China Sea, is attached to this report as an Appendix.

Nebraska U., Lincoln.
CALCIFICATION IN MARINE MOLLUSKS, by Louise H. Jodrey and Joseph L. McDonald. Annual progress rept. for 1 June-31 Aug 56 on Contract Nonr-1801(00). 9 Dec 57, 3p. AD-150 634.
Order from LC mi$1.80, ph$1.80 PB 138 648

Certain aspects of respiratory metabolism of the shell-forming tissue of mollusks was one objective of this study. Other objectives included (1) the study of dependence of the shell-forming process on respiratory processes; (2) the action of phosphatase; (3) further studies on the participation of carbonic anhydrase in the deposition of shell; (4) the evaluation of bicarbonate and decarboxylations as alternative sources of shell carbonate; and (5) studies of the chemical reactions, including the site of carbonic anhydrase intervention, concerned in the final depo-

sition of $CaCO_3$. The finding that diethyldithiocarbamate (I) inhibited respiration of the mantle was confirmed. The decrease of O consumption was measured at 3 different concentrations of I, and salicylaldoxime. Tyrosine was used as a substrate for the suspected Cu-containing enzyme. The increase in O at pH of 9.5 was measured. At low concentrations where autoxidation was negligible, catechol enhanced the oxidation of tyrosine. Attempts to use ascorbic acid to enchance O consumption were unsuccessful. DOPA was oxidized by mantle homogenates without a Cu complexing agent.

Washington U., Seattle.
MIDWATER TRAWLING STUDIES IN THE NORTH PACIFIC OCEAN [AND] DESCRIPTIONS OF A NEW SPECIES OF STOMIATID AND AN UNIDENTIFIED LEPTOCEPHALUS, by William Aron and Peter McCrery. Technical rept. no. 58 on Contract Nonr-477(10). Feb 58, 71p. 12 refs. Reference 58-3.
Order from LC mi$4.50, ph$12.30 PB 139 194

A modified version of the Isaacs-Kidd midwater trawl was used for sampling in the North Pacific. Data from catches of each of 143 hauls are presented to show corrected plankton volumes; depth of fishing; dominant plankton; identity, size range, and number of fish and fish larvae; and date, time, and location of haul. There was a wide difference between day and night catches. Findings supported previous observations that the trawl results were consistent and that plankton patchiness plays a minor role in the trawl results. Limited work with the invertebrate portion of the catches shows the possibility of commerically exploitable shrimp populations near Kodiak.

Physics of the Atmosphere

Avco Corp., Wilmington, Mass.
SINGLE STATION AND SYNOPTIC ANALYSIS OF IONOSPHERIC DATA FOR THE ARCTIC, by G. Hill and R. Penndorf. Scientific rept. no. 3 on Research Concerning Forecasting Anomalous Propagation at High Altitudes, Contract AF 19(604)4092. May 58, 121p. 12 refs. Technical rept. RAD-TR-59-19; AFCRC-TN-59-365; AD-217 316.
Order from LC mi$6.30, ph$19.80 PB 143 206

Anomalous effects in the Arctic Ionosphere were examined from two approaches. First, the time dependance of sporadic E, spread F, E, and F2 critical frequency data were studied for individual stations. The E layer, as expected, was found to be very regular. The F2 layer showed strong seasonal, diurnal, and geographical variations. Near the pole during the winter erratic variations in the F2 critical frequency were found. Sometimes the foF2 changed as much as 10 mc/s within a few hours. These changes are related to certain spread F forms. The occurrence of sporadic E was found to be more intense and more frequent at night in the auroral belt than further north. The statistics for Es $\geq$10 mc/s also followed this pattern. The number of Es occurrences was grouped into frequency bands 2 mc/s wide. It was found that they decrease from one band to the next higher one by a factor of about three.

Deutscher Wetterdienst, Aachen (West Germany).
RESEARCH ON AIR-EARTH-CURRENT IN HIGH MOUNTAINS (A CONTRIBUTION TO THE INTERPRETATION OF ATMOSPHERIC-ELECTRICAL REGISTRATIONS IN THE ALPS) by A. Kunkis. Technical note no. 8 on Contract AF 61(514)640. 15 Apr 56, 70p. 25 refs. AFCRC-TN-57-213; AD-133 680.
Order from LC mi$3.90, ph$10.80 PB 143 652

In order to fulfill the task an easily transportable measuring apparatus for the measurement of the atmospheric electrical current was developed. The apparatus has proved true under diverse unfavourable conditions (in snow and at high air moisture). Controls of the apparatus which can be easily and quickly carried out permit to keep errors with regard to the measuring values within narrow limits ($\pm$3%) and this also under unfavorable conditions. For the measuring values of the potential gradient and the air-earth-current obtained at the stations reduction factors were determined. These reduction values permit to convert the relative values measured at the stations into absolute values. All measurements are carried out with one measuring apparatus and after one measuring method at measuring places at heights from 0, 2 to 4 km and at selected atmospheric electrically undisturbed weather conditions. The measuring values reveal a variation of the conductivity with height. The conductivity increases with height after a simple exponential function.

Durham U. (Gt. Brit.)
THE DOUBLE FIELD MILL, by J. A. Chalmers and M. Smiddy. Technical note no. 1, 15 Oct 55-14 Oct 56, on Measurement of Space Charge in the Lower Atmosphere, Contract AF 61(514)891. [1956] 18p. 5 refs. AFCRC-TN-56-885; AD-110 251.
Order from LC mi$2.40, ph$3.30 PB 130 761

In order to measure the potential gradient at a point in the atmosphere a few metres above ground level, a double field mill has been constructed. The theory of the instrument and the results of tests are described.

Massachusetts Inst. of Tech., Cambridge.
STATIC STABILITY AND ATMOSPHERIC ENERGY, by Edward N. Lorenz. Scientific rept. no. 9 on General Circulation Project, Contract AF 19(604)1000. 30 Apr 57, 44p. 19 refs. AFCRC-TN-57-298; AD-117 187.
Order from LC mi$3.30, ph$7.80 PB 128 119

The process primarily responsible for the release of kinetic energy in the atmosphere, a rising of warmer air and a simultaneous sinking of colder air, also increases static stability. Gross static stability, a weighted integral of static stability, may be defined in such a way that reversible adiabatic processes have equal effects upon kinetic energy and gross static stability. Simplified dynamic equations are developed, which properly describe the relations between total potential energy, kinetic energy, available potential energy, and gross static stability. These include three dimensional systems with the equation of balance or the geostrophic equation, and n-layer models. The two-layer model may be the simplest possible system with variable static stability. The simplified equations appear to be especially suitable for theoretical studies of the general circulation and similar circulations.

Michigan U. Coll. of Engineering, Ann Arbor.
A SIMPLIFIED FALLING-SPHERE METHOD FOR UPPER-AIR DENSITY. PART II. DENSITY AND TEMPERATURE RESULTS FROM EIGHT FLIGHTS, by J. W. Peterson, H. F. Schulte, and E. J. Schaefer. Final technical rept. on Contracts AF 19(604)999 and NSF Grant Y/10.20/249. May 59, 128p. 12 refs. 2215-19-F; AFCRC-TR-59-263.
Order from LC mi$6.30, ph$19.80 PB 143 040

The development and use of the small-sphere method for synoptic measurement of upper-air density and temperature is described. The results from flights carried out during the IGY program are given.

ENGINEERING

Army Engineer Research and Development Labs., Fort Belvoir, Va.
AIRFIELD ICE REMOVAL EQUIPMENT DEVELOPMENT, by Edward C. Kinker and John L. Terry. 10 Oct 58, 28p. Technical rept. 1547-TR; AD-207 024.
Order from LC mi$2.70, ph$4.80 PB 143 265

This report contains a history of the development, tests, and evaluation of airfield ice removal equipment. Several methods of ice removal were investigated such as pavement-type heaters; blow-torch-type heater to melt scarified ice; radiation heat from hot fluids in a tubular-type landing mat; radiant-type heating system embodying electrical conductors imbedded in concrete; and de-icing chemicals. Two machines are covered in this report: one, a rotary brush as a scarifier with a trailer-mounted heater to reduce the residue to water; the other, a drag-type ice removal unit. The report concludes that: (a) The rotary ice removal machine does not meet the requirements of the project but investigation should continue if some runway scarification can be tolerated; (b) the ice drag units do not meet the requirements of the project nor can they remove hard ice firmly bonded to the surface; therefore, no further tests are warranted; (c) radiant heat should be considered for new airport construction only; (d) the Bergquist device should be investigated; (e) research should be conducted on chemicals and an investigation should be conducted on metallic paint to provide an agent to break the bond between ice and pavement.

Material Lab., New York Naval Shipyard, Brooklyn.
RESEARCH AND DEVELOPMENT OF THE STUDY OF BRITTLE FRACTURE OF SHIP PLATE STEEL BY ELECTRON MICROSCOPY, by E. C. Haas. Final rept. on Lab. Proj. 5507. 7 Jan 58, 11p. 4 refs. AD-156 658.
Order from LC mi$2.40, ph$3.30 PB 143 255

An investigation was made of the applicability of electron microscopy in determining the relationship of the microstructure of ship plate steel to its brittle fracture transistion temperature. Replication techniques were developed for imaging fractured surfaces. The electron micrographs of fractured surfaces failed to reveal physical features which were characteristic or correlatable with the transition temperature of the metal specimen, but the use of polished and etched specimens extended the usefulness of standard metallographic techniques at lower magnifications. Electron microscope studies were continued on mechanically polished and nital-etched specimens, and a large group of photographs were taken of areas considered characteristic of the specimens so that an experienced operator could match photographs with specimens. Selected electron photomicrographs are presented of several specimens of ship plate steel chosen to cover a wide range of temperature of transition from predominantly ductile to predominantly brittle fracture. The significant difference in the structures of these specimens is the spacing of the cementite lamellae, with the specimens of higher transition temperature showing a greater spacing of these lamellae.

Naval Construction Battalion Center, Port Hueneme, Calif.
PROCEEDINGS OF SYMPOSIUM ON CONSTRUCTION COST REDUCTION THRU CREATIVE DESIGN AND ENGINEERING, 29-31 OCTOBER 1957. 527p. 17 refs. AD-207 687.
Order from LC mi$11.10, ph$80.40 PB 143 439

Aeronautical Engineering

Aero Medical Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
AIRCRAFT BREATHING OXYGEN REGULATOR TEST STAND CALIBRATION PROCEDURES, by James E. P. Davis. Rept. on In Service Test Apparatus. July 59, 22p. WADC Technical note 58-28.
Order from OTS $0.75 PB 161 075

This report gives a step by step description of the procedure for calibrating an oxygen regulator test stand. Included also are sample data sheets and a discussion of good calibrating procedures which should be used to obtain best results.

Air Force Personnel and Training Research Center, Lackland AFB, Tex.
SIMULATION OF EXTRA-COCKPIT VISUAL CUES IN CONTACT FLIGHT TRANSITION TRAINERS, by William A. Lybrand, M. Dean Havron and others. Feb 58, 346p. 211 refs. AFPTRC-TR-58-11; AD-152 123.
Order from LC mi$11.10, ph$53.10 PB 143 136

A comprehensive survey and analysis of research and operational evidence pertaining to visual cues utilized by pilots in performing the specified flight tasks was accomplished. This material was supplemented by: an analysis of the operational tasks involved and intensive interviews with pilots in transition training, instructor pilots, and test pilots; consultation with subject-matter experts in training, visual perception, and engineering areas; and inspection of existing trainers and simulators having visual capabilities.

Arnold Engineering Development Center [Tullahoma, Tenn.]
CRITICAL DISCUSSION OF EXPERIMENTS ON SUPPORT INTERFERENCE AT SUPERSONIC SPEEDS, by Jack D. Whitfield. Rept. on ARO, Inc. Contract AF 40(600)700 S/A 13(59-1). Aug 58, 51p. 14 refs. AEDC-TN-58-30; AD-201 108.
Order from LC mi$3.60, ph$9.30 PB 143 275

An experimental investigation of the effect of the sting support length on the drag of slender ogive-cylinder models, with and without afterbody boat-tailing, has been conducted. These tests were made at Mach numbers 3.00 and 3.98 over a unit Reynolds number range from 10^5 to 10^6 per inch. The critical sting length as well as the base pressure is shown to be strongly dependent on the transition location and the length Reynolds number. The often quoted rule-of-thumb geometry ratio of three base diameters for an allowable sting length was inadequate for this investigation. The range of critical sting lengths encountered during this study was from approximately 5.5 for $Re_L = 1 \times 10^6$ and $M = 4.0$ to approximately 1.0 for $Re_L = 7 \times 10^6$ and $M = 3.0$.

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
EFFECTS OF BREAKOUT FORCE ON LONGITUDINAL HANDLING QUALITIES, by Fred Newell. Rept. on Contract AF 33(616)3990. Dec 57, 43p. 4 refs. WADC Technical rept. 57-155; AD-142 306.
Order from LC mi$3.30, ph$7.80 PB 138 670

The airplane used in the study was a JTB-26B equipped with variable longitudinal control and stability. The results of this evaluation indicate that control friction is an important factor in pilot's opinions of aircraft handling characteristics and that the effects of friction vary with aircraft dynamics and control force gradients. Also, the type of mission simulated affects the pilot's attitude and desires and hence, his opinions of the effects of breakout force.

Cornell Aeronautical Lab., Inc. [Buffalo, N. Y.]
AN EXPERIMENTAL INVESTIGATION OF THE H-5 VARIABLE STIFFNESS BLADE PROGRAM. PART I. HARMONIC REDUCTION OF MEASURED BLADE BEAM BENDING-MOMENT DATA, by Harold Hirsch and James Kline. Rept. on Contract W33-038-ac-14248. Dec 51, 271p. 2 refs. AF Technical rept. no. 6329, Pt. 1; AD-8445.
Order from LC mi$11.10, ph$42.60 PB 143 767

A helicopter research program was conducted with the objective of determining the bending stresses and motions experienced, in flight, by articulated rotor blades; and, thereby, to explore possible causes of a number of unexplained rotor blade fatigue failures. Measurements made with a family of blades, similar in all respects except flapwise bending stiffness, disclosed, under certain flight conditions, a hitherto unsuspected phenomenon of large amplitude resonant bending in the higher modes. Based on an analysis of these results, the necessity of, and proposed procedures for, investigating higher mode bending effects in both the design and flight evaluation phases of blade development programs are discussed. The results of the program are reported in six volumes. In this, the first volume, blade beam bending moments, measured with three sets of C.A.L. rotor blades possessing approximately 1/2, 1, and 2 times the bending stiffness of standard H-5 blades, are presented. The data cover a wide range of stabilized flight conditions; obtained by systematically varying advance ratio, helicopter center of gravity, and rotor speed.

Cornell Aeronautical Lab., Inc. [Buffalo, N. Y.]
AN EXPERIMENTAL INVESTIGATION OF THE H-5 VARIABLE STIFFNESS BLADE PROGRAM. PART 2. BLADE BEAM BENDING-MOMENT ENVELOPES, by Harold Hirsch and James Kline. Rept. on Contract W33-038-ac-14248. Jan 52, 78p. 2 refs. AF Technical rept. no. 6329, Pt. 2; AD-8444.
Order from LC mi$4.50, ph$12.30 PB 143 766

Blade beam bending moment envelopes obtained from flight test measurements made with three sets of C. A. L. fiber glass blades possessing approximately 1/2, 1, and 2 times the bending stiffness of standard H-5 blades are presented. The results cover a wide range of stabilized test conditions, obtained by systematically varying advance ratio, helicopter center of gravity, and rotor speed. Spanwise blade beam bending moment envelopes including (1) the sum of the first two and (2) the sum of the first ten terms of the harmonic representation of the measured bending moments, obtained from Part 1 of the report, are presented. The spanwise distribution of steady bending moment is also shown. (See also PB 143 767)

Cornell Aeronautical Lab., Inc., [Buffalo, N. Y.]
AN EXPERIMENTAL INVESTIGATION OF THE H-5 VARIABLE STIFFNESS BLADE PROGRAM. PART 3. EVALUATION OF ROTOR RESONANT BONDING EFFECTS, by Harold Hirsch and James Kline. Rept. on Contract W33-038-ac-14248. Jan 52, 88p. 13 refs. AF Technical rept. no. 6329, Pt. 3; AD-6265.
Order from LC mi$4.50, ph$13.80 PB 143 765

The bending moments and motions experienced in flight by articulated rotor blades were studied in an attempt to determine the causes of unexplained rotor blade fatigue failures. Blades with differing degrees of stiffness were instrumented so as to measure bending at 9 spanwise stations on each blade. A ground run-up made with medium-stiffness blades indicated that an 8/rotor revolution oscillation periodically occurred. Study of the blade deflection pattern identified the source of the oscillation to be in the third bending mode. Calculations were made which predicted that at least 1 particular combination of blade stiffness, mode shape, and rotor speed might produce a resonant condition corresponding to each harmonic order between 2 and 9. Experimental results verified the predictions. Methods suggested for avoiding one or another of the resonant points included the addition of concentrated masses to the blade to give the necessary frequency shifts, or modification of the blade stiffness. (See also PB 143 766)

Cornell Aeronautical Lab., Inc., [Buffalo, N. Y.]
AN EXPERIMENTAL INVESTIGATION OF THE H-5 VARIABLE STIFFNESS BLADE PROGRAM. PART 4.

HARMONIC REDUCTION OF MEASURED BLADE-MOTION AND CONTROL-FORCE DATA, by James Kline. Rept. on Contract W33-038-ac-14248. Apr 52, 147p. 2 refs. AF Technical rept. no. 6329, Pt. 4; AD-6161.
Order from LC mi$7.20, ph$22.80 PB 143 764

The blade motions and control forces measured with the three sets of C.A.L. test blades, possessing approximately 1/2, 1, and 2 times the bending stiffness of standard H-5 blades, are presented. The blade motions and control force data, measured simultaneously with the blade beam bending moments of Parts 1, 2, and 3, are presented in the form of harmonic components of the Fourier expansion derived from the cycles analyzed. The most informative cyclic harmonic motions and loads are presented as curves plotted versus tip speed ratio. As in the first three volumes, the data cover a range of stabilized flight conditions; obtained by systematically varying advance ratio, helicopter center of gravity and rotor speed. (See also PB 143 765)

Cornell Aeronautical Lab., Inc., [Buffalo, N. Y.] AN EXPERIMENTAL INVESTIGATION OF THE H-5 VARIABLE STIFFNESS BLADE PROGRAM. PART 5. EVALUATION OF BLADE BEAM BENDING DATA MEASURED BY THREE HELICOPTER MANUFACTURERS, by James Kline. Rept. on Contract W33-038-ac-14248. June 52, 83p. 3 refs. AF Technical rept. no. 6329, Pt. 5; AD-6794.
Order from LC mi$4.80, ph$13.80 PB 143 763

The results of analysis of beam bending flight test data measured on three different blade designs are presented to substantiate that the resonance phenomenon disclosed with the C. A. L. fiber glass blades was not an isolated occurrence. These data which were supplied by three manufacturers cover a range of flight conditions at various advance ratios and rotor speeds. The results are presented in the form of harmonic components of the Fourier expansion in order to establish the occurrence of resonance in the higher modes and enable correlation with the variable stiffness blade beam bending results, as presented in Parts 1 and 3 respectively of this report. (See also PB 143 764)

Cornell Aeronautical Lab., Inc., [Buffalo, N. Y.] AN EXPERIMENTAL INVESTIGATION OF THE H-5 VARIABLE STIFFNESS BLADE PROGRAM. PART 6. A TENTATIVE EMPIRICAL CRITERION FOR THE DESIGN OF ROTOR BLADES FOR HIGHER MODE RESONANCE, by Howard Doughaday and James Kline. Rept. on Contract W33-038-ac-14248. Nov 52, 87p. 10 refs. AF Technical rept. no. 6329, Pt. 6; AD-8443.
Order from LC mi$4.80, ph$13.80 PB 143 762

A possible empirical approach to the problem of predicting higher order bending moments is presented. Since the tentative procedure is based on test results, it would increase in reliability as more data on different types of blades becomes available. The measured blade bending moments have been harmonically analyzed previously, so that the vibration amplitude for each order of rotor excitation is known for each test condition. Knowing this amplitude, the component of the total aerodynamic force or the generalized force necessary to produce the observed response is then calculated for the given order and a particular vibration mode. These generalized forces are plotted against advance ratio and order of excitation. From the generalized forces, a dimensionless generalized force coefficient computed which can be used to predict loads on other blades. The generalized force approach was adopted because if offers the most rational means that could be found for applying the higher harmonic data obtained in the program to the design of other helicopter blades. (See also PB 143 763)

Cornell Aeronautical Lab., Inc., Buffalo, N. Y. IMPROVEMENT OF FERRYING RANGE OF ARMY HELICOPTERS, by A. C. Adler, H. S. Holm and S. A. Harrington. Final rept. on Proj. 9-38-01-000 ST801, Contract DA 44-177-tc-441. July 59, 103p. 16 refs. Rept. no. BB-1187-H-2.
Order from LC mi$5.70, ph$16.80 PB 143 573

This investigation is an extension of previous studies of maximum ferry range for single rotor helicopters. The configurations evaluated include: tandem helicopters, single rotor and tandem helicopters with auxiliary wings (compound helicopters), single rotor helicopters with auxiliary wings and propulsion (gyrodynes) and towed systems (helicopter towing tanker-glider, airplane towing helicopter). Lift-to-drag ratios for these configurations were obtained over a wide range of parameters on an IBM-704 computer. Ferrying ranges were calculated for the more promising configurations. It was found that careful attention had to be given to programming the cruise altitude with the consumption of fuel and to the compromises between power plant and airframe performance. The most promising modification appears to be the single rotor compound helicopter with a range approximately double that of the unmodified helicopter. Although an equivalent gyrodyne attains a 10% increase in range over the compound helicopter at 30% higher cruise speeds, the increased complexity, weight, and cost weigh heavily against the gyrodyne for a "one-shot" ferrying mission. Towed configurations do not appear to offer any real promise.

Curtiss-Wright Corp., Santa Barbara, Calif. FLIGHT TEST INSULATION STUDIES, by Allen G. Norem. Rept. on Aircraft Structural Research, Contract AF 33(616)5152. Feb 59, 71p. 6 refs. WADC Technical rept. 59-9; AD-208 326.
Order from OTS $2.00 PB 161 079

Model structures insulated by Refrasil B-100, phenolic CT-304 spray coated alumina, and Teflon were flight tested on a recoverable Materials Test Vehicle. The thermal response of the insulated model structures was recorded on a miniature tape recorder. It was demonstrated that the test vehicle and instrumentation used provided a suitable system for the gathering of flight test data on the effect of insulating and sublimating materials in restricting heat flow into the base structure. It was also demonstrated that the simple methods of analysis presented in Reference 1 are adequate for the prediction of the thermal response of insulated structures.

Johns Hopkins U., Baltimore, Md.
MECHANICS OF STIFFENED PLATES AND SHELLS, by W. H. Hoppmann, II. Summary and Final rept. on Contract Nonr-248(12). Mar 58, 18p. 14 refs.
Order from LC mi$2.40, ph$3.30 PB 139 198

Definition of orthogonally stiffened structures; Equations of equilibrium and motion; Stress-strain relations for orthogonally stiffened plates and shells; Shear deformation and rotatory inertia; Boundary conditions; and Strains and stresses.

Princeton U., N. J.
AN INVESTIGATION OF THE FUNDAMENTAL PARAMETERS WHICH GOVERN THE AERODYNAMICS OF VARIOUS WING-PROPELLER COMBINATIONS AS RELATED TO VECTORED SLIPSTREAM AIRCRAFT, by Norman R. Augustine. Rept. on Contract Nonr-1858(14). Oct 58, 218p. 20 refs. Aeronautical Engineering Dept. rept. no. 437.
Order from LC mi$9.60, ph$33.30 PB 143 245

Experimental investigation of propeller slipstream interaction on a heavily flapped wing. Aspect ratio, propeller diameter, solidity, thrust axis position, and propeller plane are varied to investigate the fundamental parameters which govern the wing-propeller combination. A method for analytically determining the lift and drag of a wing propeller combination is also presented.

Chemical Engineering

American Potash and Chemical Corp., Henderson, Nev.
INDUSTRIAL PREPAREDNESS STUDY ON SYNTHETIC BATTERY GRADE MANGANESE DIOXIDE, by Jerome T. Muench. Quarterly progress rept. no. 4, 29 Mar-29 June 57, on Contract DA 36-039-sc-72715. [1957] 27p.
Order from LC mi$2.70, ph$4.80 PB 130 743

Manganese dioxide was produced in two semi-pilot plant runs by the chemical oxidation of manganous sulfate. The manganous sulfate was purified by the removal of potassium by two separate methods. The first run utilized manganous sulfate purified by the manganous sulfate purified by the manganous carbonate purification method. The second run was made from manganous sulfate that had the potassium content decreased by the precipitation of potassium perchlorate. The method of preparation of the manganous sulfate as well as the chemical analysis, physical properties and battery activity tests on the manganese dioxide produced are reported. Rho manganese dioxide was produced in both runs. (See also PB 129 661)

[Army] Chemical Corps Engineering Command, Army Chemical Center, Md.
A SIMPLIFIED PASSIVATION METHOD FOR THE E24 HEATER FOR SHORT TERM SERVICE, by Oscar I. Lessig. Sep 56, 10p. Engineering Command rept. no. 13.
Order from LC mi$1.80, ph$1.80 PB 143 261

The object of the work described in this report is the investigation of a simplified method of passivation of the inner surfaces of the E24 heater tank, a component of the E24 heater. The tests described include the exposure of metal surfaces to solutions of various acids and alkalies in different concentrations, for varying periods of time. It is concluded that the use of a nitric acid solution provides the simplest and most economical method of passivation. Degreasing and exposing the inner surfaces of the E24 heater tank assembly in a 15-percent solution of nitric acid for 15 minutes adequately met the user-service requirements for this item.

Army Chemical Warfare Labs., Army Chemical Center, Md.
EFFECTS OF METABOLIC LEVEL ON PENETRABILITY OF GB THROUGH THE SKIN OF PIGS, by Francis N. Marzulli and John F. Callahan. Technical rept. for Apr 55-Nov 56 on Toxicological Action of CW Agents. Aug 58, 13p. 7 refs. CWLR 2240.
Order from LC mi$2.40, ph$3.30 PB 139 140

Swine were exposed to GB by two routes, (1) skin application and (2) subcutaneous injection. The study was predicted on metabolic activity (as induced by seasonal changes) and its relation to GB susceptibility. No effect due to raised metabolic level was found regardless of the route of administration of GB. The inhibition of red blood cell cholinesterase from a small subcutaneous dosage of GB had no predictive value regarding susceptibility to lethal effects from a larger successive dosage for any one individual animal; this may be of some value for larger groups.

Franklin Inst. Labs. for Research and Development, Philadelphia, Pa.
PRODUCING PERMANENTLY HYDROPHYLIC SURFACES ON PLASTIC FILMS FOR SOLAR STILLS, by Robert A. Erb. Final rept. for 14 Nov 58-31 Aug 59 on OSW Contract 14-01-001-168. Sep 59, 29p. Research and Development progress rept. no. 29.
Order from OTS $0.75 PB 161 064

Two principal means of producing permanent, transparent hydrophilic surfaces on a variety of plastic films for solar still condensing surfaces were investigated on this project. One involves the vacuum deposition of silicon monoxide on the surfaces; the other involves the chemical deposition of titanium dioxide on the surface via the hydrolysis of tetraalkyl orthortitanates. Both have proved to be technically feasible for producing hydrophilic permanent surfaces over the plastic substrates. However, the titanium dioxide process is the present process of choice for large scale film treatment because of lower cost (both for capital equipment and operation) and ready adaptability to a large scale operation.

I. G. Farbenindustrie, A. G., Ludwigshafen (Germany).
HYDRAZINHYDRAT-ANLAGE. May 46, 5p.

BIOS/DOCS/2082/829/101; FD 2380/46. Text in German.
Order from LC mi$1.80, ph$1.80 PB 143 571

Institute of Tech., U. of Minnesota, Minneapolis.
INVESTIGATION OF FREEZING AS A MEANS OF OBTAINING FRESH WATER FROM SALT WATER, by Emory N. Kemler, Millard H. LaJoy and others. Progress rept. no. 1 on Contract NOy-73248. 15 July 54, 19p.
Order from LC mi$2.40, ph$3.30 PB 139 168

The tests described in this progress report were designed to give general information on the conditions which exist during the freezing of salt water.

Institute of Tech., U. of Minnesota, Minneapolis.
INVESTIGATION OF FREEZING AS A MEANS OF OBTAINING FRESH WATER FROM SALT WATER, by Emory N. Kemler, Millard H. LaJoy and others. Progress rept. no. 2 on Contract NOy-73248. 15 Sep 54, 41p.
Order from LC mi$3.30, ph$7.80 PB 139 167

This report describes the experimental results of tests on salt content of ice formed from sodium chloride solutions by freezing on a flat surface. An analytical study of rate of ice formation with experimental verification is also included. The tests showed that the salt content of ice frozen on a flat surface from a saline bath was significantly lower than the concentration of the brine solution. (See also PB 139 168)

Electrical and Electronic Engineering

Air Force Armament Center, Eglin AFB, Fla.
AFAC NAVIGATION SYSTEMS FLIGHT TEST RANGES. Armament Test note. Sep 57, 47p. AFAC-TN-57-53; AD-135 965.
Order from LC mi$3.30, ph$7.80 PB 142 903

The AFAC Navigation Systems Flight Test Ranges, formerly known as the AFAC Inertial Guidance Systems Flight Test Ranges, were established to fulfill a requirement for the testing of long-range navigation systems. The three ranges extend over a variety of topographical features and constitute a flexible all-weather, long-range test facility. These ranges are available to any agency engaged in the testing of navigation systems and require only that the test aircraft be capable of taking vertical aerial photographs and/or radar-scope photographs. Range No. 1, which is approximately 1030 nautical mi in length, extends from Eglin AFB, Fla., L. G. Hanscom Field, Bedford, Mass. Range No. 2, extending from Ramey AFB, Puerto Rico, to Mountain Home AFB, Idaho, is approximately 2865 naut mi in length. Range No. 3 extends from Eglin AFB, Fla., to Holloman AFB, New Mexico and is approximately 1010 naut mi long. The course center line, or axis of strength, of each range is a geodesic computed on the Clarke Spheroid of 1866 as referenced to the 1927 North American Datum. Bands of checkpoints, both visual and radar, located 35 to 70 mi apart and extending 25 mi to either side of the range center line, are used to obtain positional information along the ranges. Reduction of the photographic position data is facilitated by the use of a Laborde Grid overlay on each range whereby any position on the range corridor can be located by a set of X and Y coordinates as well as by latitude and longitude. A discussion of geodesy with particular emphasis on computational techniques and on error study are available as a supplement.

Air Force Cambridge Research Center, Bedford, Mass.
EXPERIMENTAL STUDY OF A DIFFRACTION REFLECTOR, by Joseph H. Provencher. Apr 59, 33p. 3 refs. AFCRC TR-59-126; AD-212 926.
Order from LC mi$3.00, ph$6.30 PB 142 998

A microwave antenna has been designed and constructed on the principles of parageometric optics formulated by Toraldo di Francia and on principles similar to those of Fresnel rings and the diffraction grating. Its surfaces are all zones of cones and simple to construct. The chosen design parameters were incorporated in two K-band ($\lambda = 1.24$ cm; $\lambda = 1.22$ cm) models. Experimental results show good agreement with theory. Scanning characteristics are superior to those of the paraboloidal or spherical reflector, and spherical aberration and coma are minimized, and the effects of astigmatism are minimized by using a "compromise focus."

American Electro Metal Div., Firth Sterling, Inc., Yonkers, N. Y.
RESEARCH ON THERMIONIC EMISSION OF BORIDES, by R. Steinitz. Final rept. on Contract AF 18(600)1504. 1 May 57, 36p. 27 refs. AFOSR-TN-57-312; AD-132 383.
Order from LC mi$3.00, ph$6.30 PB 143 513

Thermionic emission measurements were performed on most of the transition metal diborides, gadolinium hexaboride, and dense and porous tungsten cathodes. With the exception of the dense tungsten, which was used to standardize the test equipment, all samples were prepared by powder metallurgical techniques. The necessary vacuum system and electrical circuits were constructed to fit the requirements. The emission constant and work function for each of the above metals has been calculated from the emission data. However, in view of the above discussion, the reliability of the data is questionable. A simple solution to most of these problems has been planned for the future.

Antenna Lab., Ohio State U. Research Foundation, Columbus.
POLARIZATION DEPENDENCE OF RADAR ECHOES, by J. N. Hines, and J. A. McEntee. Rept. on Echo Area of Acute-Angle Dihedral Corner Reflectors, Contract AF 30(635)2811. 31 Oct 56, 23p. 2 refs. Rept. 612-13;

AD-114 242.
Order from LC mi$2.70, ph$4.80 PB 138 993

To add to the available information on corner reflectors, patterns of acute-angle dihedral corner reflectors were recorded, for different included angles, as a function of the azimuth angle. The responses to both linear polarizations, and also to circular polarizations, are presented.

Armco Steel Corp., Middletown, Ohio.
DEVELOPMENT OF MAGNETIC MATERIALS. Final rept. for 1 July 47-30 June 51 on Contract NOas-8944. 31 July 51, 26p.
Order from LC mi$2.70, ph$4.90 PB 143 865

Improved core material for 400-cycle airborne power transformers; Vicalloy; Orthonik; Hiperco; Ultra thin magnetic material; Alperm.

Armour Research Foundation, Chicago, Ill.
DESIGN DATA FOR CRYSTAL OSCILLATOR CIRCUITS, by Harold E. Gruen and Alan O. Platt. Rept. on Contract DA 36-029-sc-64609. Aug 57, 160p. 1 ref. AD-151 454.
Order from LC mi$7.50, ph$24.30 PB 143 562

This manual provides the information necessary to select a crystal oscillator design for operation at frequencies throughout the 0.8 to 150 mc range, and indicates methods of predicting the performance characteristics of these circuits under wide variations in operating conditions. In general, output voltage predictions are within 20 per cent of the values indicated for specific oscillator circuit designs. Crystal drive prediction accuracy is within 30 per cent. This latter figure is based on measurements of crystal voltage and assumed resistive operation of the crystal.

Army Engineer Research and Development Labs., Fort Belvoir, Va.
WEATHER RESISTANCE OF RUBBER SHEETS AND RUBBER COVERED CABLES, by Philip Mitton and Frank E. Rupert. 10 July 58, 41p. Technical rept. 1535-TR; AD-204 008.
Order from LC mi$3.30, ph$7.80 PB 143 266

This report covers an investigation to determine the weather-resistant properties of commercial and military cables in order to provide performance standards for use in future procurement. Samples of rubber sheets were tested for physical properties (tensile strength, ultimate elongation, tensile strength at 200 percent elongation) and low temperature properties (torsional stiffness ratio, tension recovery, and brittleness). Comparison of materials after tests revealed that physical characteristics indicated by weatherometer exposures differ markedly from physical characteristics after exposure in the ozone chamber and outdoors. The discussion of test results includes comment on the effect of exposure on test materials.

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
INVESTIGATION OF GABRIEL AT-781/U ANTENNA, by Kenneth L. White, Charles R. Wise, and Harvey G. Lassiter. 29 July 59, 146p. AFC rept. # ANT-29-7-59.
Order from LC mi$7.20, ph$22.80 PB 143 416

Results are presented on an investigation of the Gabriel Company, AT-781/U Antenna. The electromagnetic reception characteristics of the antenna for linearly polarized signals, i.e., horizontal, vertical, and $\pm 45^{o}$, were determined in the azimuth plane for effective elevation angles of 0, 30, 60, 75 and 90^{o}; elevation patterns were also made. The reception characteristics of the antenna were tested and patterns made at 409, 417, 440, 515 and 540 MCS. The VSWR of the antenna was less than 1.66 throughout the frequency range of 400 - 550 MCS.

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
LABORATORY INVESTIGATION OF GILFILLAN BROS., INC., MODEL IIA TELEMETRY TRANSMITTER, by Virgilio Cisneros, William Castilo, and Mervin Olson. 27 July 59, 48p. AFC rept. # TM-27-7-59-T.
Order from LC mi$3.30, ph$7.80 PB 143 417

Results of a Laboratory Investigation, concerning the Gilfillan Bros., FM Telemetry Transmitter Model IIA, are given. Operational characteristics, such as frequency stability, power output, and modulation sensitivity were examined against the parameters of voltage variation, operating time and simulated altitude. Interference characteristics (spurious emissions, both antenna conducted and case radiated) were also examined. Frequency stability was $\pm$ 0.007% (within the required 0.01% as per WSMR Reg Nr 600-3-58) for all tests except prolonged exposure to simulated altitude(s) in which the case temperatures were below 0^{o} C; for normal missile and rocket applications (15 minutes or less in duration) this situation would not arise. Spurious emissions (antenna conducted) met the above regulation requirement(s) however, it is expected that careful alignment and a rigid quality control system will be necessary to assure that proudction items also meet this requirement.

[Army Signal] Radio Propagation Agency, Fort Monmouth, N. J.
RADIATION FROM ANTENNAS IN THE 2 TO 30 MEGACYCLE BAND. Revised May 58, 323p. 20 refs. Technical rept. no. 2.
Order from LC mi$11.10, ph$50.10 PB 143 147

This report shows graphically the sky-wave and ground-wave radiation in the 2 to 30 megacycle frequency band from the following antennas: Ground-Based Vertical, Ground-Based Inverted "L", Horizontal Half-Wave, and Horizontal Rhombic. The curves of this report are based mainly on theoretical calculations for assumed current distributions on thin wires. The ground system and antenna heat losses are accounted for by efficiency factors ob-

tained from field measurements. The calculations consider the effects of the type of ground over which the antenna is erected in the ground reflection factors and antenna radiation resistances. It is assumed that the transmission lines are properly matched and that the antenna reactances are tuned out.

[Army Signal] Radio Propagation Agency, Fort Monmouth, N. J.
GROUND WAVE FIELD INTENSITIES INCLUDING GROUND WAVE FIELD INTENSITIES WITHIN THE LINE OF SIGHT. Rev. June 49, Second printing Apr 56, 234p. 13 refs. Technical rept. no. 3.
Order from LC mi$10.20, ph$36.30. PB 143 148

This report was prepared to show in a graphical form the expected ground-wave field intensities for vertical polarization for frequencies from .1 to 300 megacycles per second. The field intensities for elevated antennas within certain distance limitations are obtained by multiplying values obtained for antennas located at the ground by height gain factors. These ground-wave field intensities are based mainly on theoretical calculations for transmission over smooth spherical earth. The curves of this report are applicable over a wide range of distances for frequencies from .1 to 300 megacycles, provided the antenna heights are not too great. Ground-wave field intensities are given within the line of sight for antennas of low electrical heights. The ground-wave curves of this report are drawn for average atmospheric conditions. The curves are based on standard atmosphere in which the index of refraction decreases linearly with height at a rate of $.039 \times 10^{-6}$ per meter.

Army Signal Research and Development Lab., Fort Monmouth, N. J.
CALIBRATION PROCEDURE FOR 254 JAN DROP TESTER, by Royce D. Loveland. 15 May 58, 24p. USASRDL Technical rept. 1969.
Order from LC mi$2.70, ph$4.80 PB 138 636

The 254 JAN Drop Tester is a shock machine designed to subject small electronic components to shock impacts up to 1500 g for a time duration of approximately one millisecond. Included in this manual are drawings for the construction of a 254 JAN Drop Tester and information regarding maintenance procedures and techniques used for the calibration of the Drop Tester.

Army Signal Research and Development Lab., Fort Monmouth, N. J.
400-MEGACYCLE SUPERREGENERATIVE CIRCUITRY,, by Robert W. Callinan. 1 Oct 58, 26p. USASRDL Technical rept. 1985.
Order from LC mi$2.70, ph$4.80 PB 139 077

An investigation was conducted to devise 400-mc superregenerative circuitry capable of detecting modulations which have comparatively high-frequency components. The detection of one to two microsecond pulses and also 80 kilocycle sine waves was of particular interest. Numerous forms of detectors were devised and tested. Performance was evaluated where possible at different operational modes. Of the circuits tested, a plate-quenched, logarithmic-mode type appears best for most applications. Two megacycles appears to be the highest practical quench frequency for operation at 400 megacylces. This limits sine wave detection to a maximum frequency of 200 kilocycles and the efficient detection of pulses to those with a duration of at least five microseconds.

Army Signal [Research and Development Lab.] Fort Monmouth, N. J.
RADIO SET AN/VRC-24(XC-2) by Michael Kaluzienski. Jan 58, 191p. Engineering rept. no. E-1228 AD-201 812.
Order from LC mi$8.70, ph$3.30 PB 142 673

Radio Set AN/VRC-24(XC-2) is an amplitude modulated receiver transmitter designed to operate in the frequency range of 225.0 to 399.9 mcs providing 1750 crystal controlled channels with a spacing of 100 kc. The selection of any of 19 preset channels may be made from the front panel of the radio set or from a remote control position. Any one of the total number of channels available may be directly set up by manual tuning at the front panel. The same basic receiver transmitter unit is designed for vehicular, semi-fixed and fixed station applications.

Assistant Secretary of Defense, Research and Development, Washington, D. C.
SYMPOSIUM ON ELECTRONICS MAINTENANCE [NO. 2]: DESIGN FOR EASE OF MAINTENANCE. 8-11 May 56, 208p. 28 refs. PPT 202/5.
Order from OTS $3.50 PB 161 107

Contents:
Session 1. What role do you see for human engineering in improving the maintenance problem now?
Session 2. Looking ahead to an era of miniaturization, unitization and automation, what future do you see for human engineering?
Session 3. What engineering techniques and practices are available in designing equipment to reduce the maintenance job?
Session 4. Logistics has become an integral part of the maintenance problem; what do you see as the engineer's problem? the human engineer's problem?
Session 5. How can engineers and human engineers together improve the design for equipment maintenance?

The symposium covers ways and means of ensuring that electronic equipment is designed initially so that the functions of trouble shooting, maintenance records, calibration, replacement and repair are simplified and geared to the military personnel and training subsystem. In the area of designing for maintenance, much progress has been made in recent years, but still greater progress is required. This report will serve to stimulate further research and application in this vital field.

Ateliers de Construction Electriques de Charleroi (Belgium).
THEORETICAL CALCULATIONS OF CAPACITIES AND INDUCTANCES OF PRINTED CIRCUITS, by Ph. Passau and A. Lion. Rept. on Contract AF 61(514)921. 14 Feb 58, 355p. 17 refs. AFCRC TR-

58-136; AD-152 389.
Order from LC mi$11.10, ph$54.60 PB 142 952

Contents:
Capacity of printed capacitors
Losses in printed capacitors
Susceptance or printed inductors
Losses in printed inductors
Experimental confirmation of the theoretical results

Avion Div. [American Car and Foundry Co.] Alexandria, Va.
ELECTROPHOTOGRAPHIC VIEWER AN/GSQ-14-14-(XW-1), SHAPE DETECTION PHASE, by Horace M. Joseph and Donald L. Feller. Final engineering rept. for 19 Dec 57-13 June 58 on Contract AF 30(602)1499. 23 June 58, 86p. RADC-TR-58-103; AD-148 832.
Order from LC mi$4.80, ph$13.80 PB 143 497

The program of investigation and study to determine the feasibility of automatic "photo-reading" was continued. Basic and Automation experimentation was performed which verified the soundness of the conceptual methods of shape finding and comparison. Additional conceptual designs for shape comparison and analog methods for the mathematical computations derived from curve following information are presented. The development of a complete shape detection system including contrast processing for utilizing any source of two-dimensional input information is recommended.

Bureau of Yards and Docks, Washington, D. C.
RADIO COMMUNICATION FACILITIES (SHORE-BASED). 1 May 53, 58p. Technical pub. NAVDOCKS TP-Pw-20.
Order from OTS $1.50 PB 161 059

This publication provides guidance for Bureau personnel concerned with the planning, site selection, design, construction, and maintenance of buildings, together with related services and installed facilities and/or radio towers, for shore-based radio communications at naval shore activities. Part A presents the authority and responsibilities of this Bureau for providing the public works and public utilities that form the nonelectronic part of the Navy's shore-based radio communications, and defines related terms. Part B covers general and specific site planning for the various types of radio communication stations. Part C deals with radio receiver buildings, Part D with radio transmitter buildings, and Part E with radio communication centers and terminal equipment buildings. Part F covers radio direction finder facilities, Part G control link facilities, and Part H antenna and ground systems.

California Inst. of Tech. [Pasadena].
EXPERIMENTS IN VERY LOW-FREQUENCY RADIO PROPAGATION, by Roger M. Golden. Technical rept. no. 5 on Contract AF 18(600)1552. 26 June 59, 129p. 37 refs. AFOSR TN-58-583; AD-217 030.
Order from LC mi$6.30, ph$19.80 PB 142 987

Propagation in the presence of the ionosphere is considered in the theoretical form of propagation in a homogeneous gyroelectric medium. The results of this analysis are tabulated in graphical form so that the dispersive qualities of the medium can be readily examined. With the aid of these results, an examination of the natural phenomena of whistlers is presented in order to determine the feasibility of generating gyroelectric-echoes. Reflection and transmission coefficients are presented for vertical incidence in order to ascertain the order of magnitude of such an echo. Experiments thus far performed have not yielded echoes but with modifications in the transmitting and receiving equipment, echoes may be detected. A complete description of the experimental equipment used is given along with a proposal for a more sophisticated receiving system.

Chicago Midway Labs., U. of Chicago, Ill.
SEMICONDUCTORS AND PHYSICAL ELECTRONICS. Final rept. for 1 Jan 56-30 June 58 on Contract AF 18(603)09. 30 June 58, 19p. 18 refs. CML-TR-P108-18; AFOSR TR-58-137; AD-204 556.
Order from LC mi$2.40, ph$3.30 PB 138 623

Abstracts of papers published elsewhere by the authors on preparation of large InSb and InAs crystals, secondary electron emission, an image amplifier, a thermal image tube, and infrared detectors. Growth of large single crystals by pulling from the melt has been on a routine basis. The purity of pulled crystals is always below that of the zone-refined material from which they are made. Distribution coefficients of four common impurities -- cadmium, zinc, selenium, and tellurium -- in single crystals of InSb pulled from the melt have been determined by electrical measurements.

Columbia U. School of Electrical Engineering, New York.
PULSE WIDTH CONTROL OF SAMPLED DATA SYSTEMS, by Winston L. Nelson. Technical rept. T-35/B on Contract AF 18(600)677. 6 July 59, 157p. 25 refs. CU-55-59-AF-677-EE; AFOSR-TN-59-609; AD-217 396.
Order from LC mi$7.50, ph$24.30 PB 143 175

The use of pulse width control for the on-off regulation of systems subject to sampled data is investigated in this paper. The pulse width controller is considered to effect control of a linear n^{th} order plant by applying to the plant during each sampling period an input signal, selected from the restricted class of pulse width control signals, and based on the state of the plant at the sampling instant. The basic capabilities of this type of control are investigated in relation to simple on-off, or relay, control and in relation to pulse amplitude control. General methods for achieving both stable and optimal control are developed and practical design applications are considered. Examples and experimental evaluation of the design methods are also given.

David Sarnoff Research Center, Princeton, N. J.
STUDY OF PHOTOEMISSIVE SURFACES, by A. H. Sommer and W. E. Spicer. Final rept. for 1 July 55-31 Dec 57 on Contract DA 44-009-eng-2515. [1957] 29p. 1 ref. AD-203 475.
Order from LC mi$2.70, ph$4.80 PB 143 325

Heretofore the silver-oxygen-cesium (Ag-O-Cs) cathode has been the only known photoemitter with appreciable response to infrared radiation. During the last 25 years much work was done to improve infrared sensitivity as well as to understand the mechanism of electron emission of this material, but in both directions only minor results were obtained.

Diamond Ordnance Fuze Labs., Washington, D. C.
FREQUENCY-MODULATED ACOUSTIC FLOWMETER AND METHODS OF MAKING IT FEASIBLE, by James C. McDade. 15 Dec 58, 11p. 3 refs. Technical rept. TR-660.
Order from LC mi$2.40, ph$3.30 PB 139 145

The existing acoustic flowmeter is frequency modulated to eliminate the effect of leakage in thick-walled steel pipes. A delay line which presents a time delay equal to that in the sound path is used in conjunction with the sound path to cancel the effects of the FM at the phasemeter. A method was devised for eliminating the need for the delay line. This method consists in choosing the modulation frequency such that the two signals arrive at the phasemeter in phase(except for the effects of flow) because the sound signal is delayed by a time equal to the modulation period.

Diamond Ordnance Fuze Labs., Washington, D. C.
MICROELECTRONICS: AN INTRODUCTION AND A STATUS REPORT, by T. A. Prugh. 1 Nov 57, 11p. 3 refs. TR-536.
Order from LC mi$2.40, ph$3.30 PB 143 566

Two techniques have been developed for constructing small electronic transistorized modules. The first uses etched wiring boards and standard subminiature components. The second technique gives a greater than ten to one volume reduction over the first by incorporating an uncased transistor directly into a printed circuit ceramic plate. The degree of reduction is such that optical aids must be used in constructing and inspecting the circuitry; a new term, microelectronics, has been selected to embrace the latter technique and related efforts in system design, power supplies.

Diamond Ordnance Fuze Labs., Washington, D. C.
MICROPHONISM IN MICROWAVE CRYSTAL MIXERS, by William K. Saunders. 10 July 56, 13p. Technical rept. no. TR-363.
Order from LC mi$2.40, ph$3.30 PB 127 980

The microphonic effects noted in a microwave crystal mixer subjected to vibration are investigated. The experimental procedures and results are presented in detail. The conclusion is that the catwhisker of the type 1N23 crystal is mechanically resonant at some frequencies of vibration; another type of crystal is found to perform satisfactorily under the same conditions.

Electrical Engineering Research Lab., U. of Illinois, Urbana.
ACTIVE NETWORK SYNTHESIS BY LATTICE REDUCTION, by R. E. Thomas. Technical note no. 8 on Contract AF 49(638)63. 15 May 59, 100p. 25 refs. AFOSR-TN-59-584; AD-217 031.
Order from LC mi$5.40, ph$15.30 PB 143 515

The standard lattice synthesis technique is extended to active networks in which the available network elements are positive and negative resistors and capacitors. The designation of the immittances of the arms of the active lattice as "single NIC realizable" is shown to be useful and to lead to a variety of lattice realizations including the constant-resistance lattice. The general method described for synthesizing the active lattice requires the introduction of a surplus factor with real, simple and negative zeros. Several procedures are given for reducing the active lattice to an unbalanced equivalent two port made up of resistors, capacitors and negative impedance converters. Both reciprocal and non-reciprocal reductions are obtained. NIC biasing provisions and termination conditions are met by inserting appropriate immittances into the lattice at an appropriate stage of the reduction process.

Electrochemical Research Lab., Western Reserve U., Cleveland, Ohio.
A REVIEW OF THE STATE OF THE ART AND FUTURE TRENDS IN FUEL CELL SYSTEMS, by Ernest Yeager. Technical rept. no. 10 on Contract Nonr-2391(00). 1 Dec 58, 57p. 30 refs.
Order from LC mi$3.60, ph$9.30 PB 143 567

This report summarizes the present status of various fuel cell systems including the low and high temperature hydrogen-oxygen cells, hydrocarbon consuming cells, and the alkali metal amalgam continuous feed cell. The specific features of these systems are considered in terms of small and large scale power generation. Cells of the fuel cell type also offer promise as components of closed cycle systems in which the cell reactants are regenerated from the cell products by such means as photochemical, radiochemical, electrolytic, and thermal dissociation.

Electronic Defense Lab., Sylvania Electric Products, Inc., Mountain View, Calif.
AN EXTENSION OF STOKES' EQUATIONS AND ITS APPLICATION TO THE REFRACTIVITY OF THIN FILMS, by Arthur Wickersham. Rept. on Contract DA 36-039-sc-73170. 4 Oct 57, 25p. 12 refs. Technical memo. rept. no. EDL-M118; AD-148 175.
Order from LC mi$2.70, ph$4.80 PB 138 564

A point of view is developed in which the refractivity of periodic structures is ascribed to a mechanism related to surface waves. The results of such development are compared with data taken at microwave frequencies.

Electronics Research Lab., Stanford U., Calif.
A CIRCUIT FOR SELECTING AND AMPLIFYING WITHOUT TUNING ADJUSTMENT A REDUCED CARRIER IN THE PRESENCE OF VOICE SIDEBANDS

AND NOISE, by Robert C. Morwood. Technical rept. no. 10 on Contract W28-099-ac-131. 31 Aug 53, declassified 22 Sep 54, 29p. AD-22 022.
Order from LC mi$2.70, ph$4.80 PB 143 757

A circuit for selecting and amplifying without tuning adjustment. A reduced carrier in the presence of voice sidebands and noise.

Electronics Research Lab., U. of California, Berkeley.
LINEAR ANALYSIS OF CONTROL SYSTEMS WITH MAGNETIC AMPLIFIERS, by T. T. Kadota. 11 Nov 58, 68p. 18 refs. Series no. 60, issue no. 216.
Order from LC mi$3.90, ph$10.80 PB 139 062

Dyanmic representation of a control system, which includes a magnetic amplifier as its component, is essentially a problem of incorporating a discrete system (the magnetic amplifier) with a continuous system (the remainder of the control system). The intrinsic difficulty of the problem lies in the fact that the magnetic amplifier is a pulse-width modulating system, which makes unfeasible direct application of the modified z-transform and the P-transform methods. By appling the technique of "multipole expansion" in electromagnetic theory with proper treatment of Dirac delta-function, however, we can obtain both a general dynamic representation of such a control system and its linear approximation in terms of the modified z-transform. Since in practice the condition for the linear approximation is usually met and the modified z-transform method is readily available, the latter is immediately applicable for the analysis and synthesis of mixed systems which include pulse-width modulators such as the magnetic amplifier. The general representation, on the other hand, is primarily of theoretical value in that it not only gives explicitly the criterion for validity of (or the error involved in) the linear approximation but also sets the z-transform theory on a more rigorous mathematical basis. This report presents the detailed derivation of these representations and illustrates their theoretical and practical applications.

Georgetown Coll. Observatory, Washington, D. C.
A TIME SIGNAL FILTER AND AMPLIFIER FOR RECORDING WWV, by F. J. Heyden and Leland LeFevre. Technical rept. no. 5 on Contract AF 19(604)2229. May 58, 5p. Georgetown Observatory Mono. no. 10; AFCRC TN-58-420; AD-152 587.
Order from LC mi$1.80, ph$1.80 PB 138 713

The National Bureau of Standards Radio Station, WWV, broadcast standard time signals. This signal consists of five cycles of a one-thousand cycle sine wave occurring on the second, with the fifty-ninth second of each minute being omitted. Also present are standard musical notes, voice frequencies and C. W. Code. To utilize accurately the time signals, all interfering signals must be eliminated. An electronic filter has been designed for that purpose.

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
ESTIMATION OF THE FREQUENCY OF A PERIODIC SIGNAL CONTAINING NUISANCE PARAMETERS IN THE PRESENCE OF NOISE, by John H. MacKay. Final technical rept. on Contract Nonr-991(04). 15 May 58, 46p. 39 refs.
Order from LC mi$3.30, ph$7.80 PB 138 815

For a stationary Gaussian process superimposed on a single trigonometric term, the main problem considered is that of estimating the frequency of the periodic component. Estimates consistent for all values of the nuisance parameters are obtained. Crude upper bounds are given for the sample sizes (observation periods) necessary in order that the estimates be close to the true value with high probability. Various estimation schemes which have been proposed are discussed and objections to them are recorded. No completely satisfactory (theoretical) solution to the problem is yet available; some of the reasons for this situation are outlined. Criteria for choosing good estimates are discussed and some properties of a priori distributions and bayes solutions outlined. Methods of attack which might lead to additional information about the problem are given.

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
INVESTIGATIONS OF PRECISION FREQUENCY CONTROL TECHNIQUES, by Samuel E. Meek and Samuel N. Witt, Jr. Quarterly rept. no. 3, 1 Oct-31 Dec 55, on Contract DA 36-039-sc-64597. [1955] 43p. 2 refs.
Order from LC mi$2.30, ph$7.80 PB 139 088

The individual elements of the short-term frequency measuring system are described and the complete system is evaluated theoretically. Under certain assumptions, a sensitivity of 0.0637 mv/cycle of frequency change is indicated. This represents the available i-f voltage input to the i-f amplifier where a maximum additional gain of 140 db is available. Data are presented on the long-term performance of an invar cavity-controlled oscillator immersed in a temperature regulated oven. Constructional details of this oscillator are illustrated. Results of measuring the temperature-frequency characteristics of silver-plated Stupalith cavities are given.

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
STUDY OF THE EFFECTS OF PROCESSING TECHNIQUES AND MATERIALS ON AGING OF QUARTZ CRYSTAL UNITS, by Richard B. Belser and Walter H. Hicklin. Quarterly rept. no. 6, 15 Aug-15 Nov 56, on Contract DA 36-039-sc-64613. [1956] 179p.
Order from LC mi$8.40, ph$27.80 PB 138 824

A new frequency measuring technique, based on the balanced-bridge circuit has been adapted to use on this project provided accurate and rapid frequency measurement.

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
STUDY OF THE EFFECTS OF PROCESSING TECHNIQUES AND MATERIALS ON AGING OF QUARTZ CRYSTAL UNITS, by Richard B. Belser. Quarterly rept. no. 7, 15 Nov 56-15 Feb 57, on Contract DA 36-039-sc-64613. [1957] 128p. AD-131 436.
Order from LC mi$6.30, ph$19.80 PB 138 823

Frequency measurements of 91 gold-plated resonators have been continued. The number of units and the types of containers were as follows: 16 units in nickel-silver HC-6/U cans, double-electrocleaned; 19 units in nickel-silver HC-6/U cans, hydrogen-fired; 15 units in copper HC-6/U cans, double-electrocleaned; 5 units in copper HC-6/U cans, hydrogen-fired; 19 units in copper HC-6/U cans, enamel-lined; 12 units in glass containers, evacuated; and 5 units in glass containers, argon filled. Of the 91 units, 76 were stable and drifted less than 0.00005 percent in the last 60 day period of test; only 15 were unstable. Ten of these latter were in the hydrogen-fired groups. All units mounted in glass were stable. However, exceptionally stable frequencies were observed for the majority of units in each type of container. Unstable units gave frequency measurements typical of leakers. The incidence of failure was greater in hydrogen fired containers, and the number of failures appeared to be related to sealing difficulties encountered with containers receiving the hydrogen firing treatment. Fabrication and measurement techniques by the new balanced bridge method have been greatly improved as demonstrated by the data presented. A major problem still remaining to be studied is the aging effect introduced by overcoating resonators to frequency. (See also PB 138 824)

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
TRANSISTOR OSCILLATORS OF EXTENDED FREQUENCY RANGE, by B. J. Dasher, D. L. Finn and others. Quarterly rept. no. 1 on Contract DA 36-039-sc-42712. 30 Sep 53, 34p. 7 refs.
Order from LC mi$3.00, ph$6.30 PB 138 196

Some basic factors that determine the frequency stability of series-mode oscillators are reviewed. It is shown that frequency stability with respect to an unstable impedance, Z_2, depends on the ratio $(\partial X_1/\partial Z_2)/(\partial X_o/\partial \omega)$, in which X_o is the reactance of the resonator and X_1 is the reactance of the circuit external to the resonator. First-order effects of nonlinearity are investigated, and attention is called to the fact that L/C is fundamentally more important than Q as a figure of merit of the resonator in this type of oscillator.

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
TRANSISTOR OSCILLATORS OF EXTENDED-FREQUENCY RANGE, by B. J. Dasher, D. L. Finn and W. B. Jones, Jr. Quarterly rept. no. 2 on Contract DA 36-039-sc-42712. 31 Dec 53, 43p. 10 refs.
Order from LC mi$3.30, ph$7.80 PB 138 197

The operation of series-mode oscillators of the negative-resistance type is discussed in detail. The relation between amplitude stability and distortion is considered, and it is shown that distortion is necessary to amplitude stability in this kind of oscillator. Frequency "pulling" due to distortion can be computed by means of Groszkowski s equation. Tests on simple transistor oscillators at 1,000 cps show a fairly good agreement between computed and measured frequency. Frequency stability is also considered from the point of view of linear circuit theory. (See also PB 138 196)

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
TRANSISTOR OSCILLATORS OF EXTENDED FREQUENCY RANGE, by B. J. Dasher, W. B. Jones, Jr. and S. N. Witt, Jr. Quarterly rept. no. 3 on Contract DA 36-039-sc-42712. 31 Mar 54, 30p. 11 refs.
Order from LC mi$2.40, ph$3.30 PB 138 198

The results of a series of experiments performed for the purpose of finding out whether Groszkowski's equation gives sufficiently accurate results to be useful in computing the frequency pulling due to distortion in transistor oscillators are described. These tests were made on series-mode oscillators at 1,000 cps. When the pulling is of the order of 0.5 per cent, the theory accounts for about four-fifths of it. The cause of the remaining discrepancy has not been determined. Evaluation tests on several transistor-oscillator circuits have been made. (See also PB 138 197)

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
TRANSISTOR OSCILLATORS OF EXTENDED FREQUENCY RANGE, by B. J. Dasher and S. N. Witt, Jr. Quarterly rept. no. 4 on Contract DA 36-039-sc-42712. 30 June 54, 32p. 11 refs.
Order from LC mi$3.00, ph$6.30 PB 138 199

An analytical treatment of two-terminal oscillators is begun in this report. The analysis is based on a Fourier series representation in which the nonlinear negative resistance characteristic is approximated by means of straight-line segments. Instead of assuming the characteristics to be nearly linear the oscillation is assumed to be nearly sinusoidal. In the case of a series-mode oscillator this assumption implies a sinusoidal current which permits the voltage to be expressed as a Fourier series. The ratio of the fundamental component of voltage to the fundamental component of current is the effective input resistance which, when considered as a function of the current amplitude, permits the amplitude of oscillation to be determined for a specified external circuit. (See also PB 138 198)

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
TRANSISTOR OSCILLATORS OF EXTENDED FREQUENCY RANGE, by B. J. Dasher, D. L. Finn and others. Quarterly rept. no. 5 on Contract DA 36-039-sc-42712. 30 Sep 54, 53p.
Order from LC mi$3.60, ph$9.30 PB 138 200

The analysis of two-terminal oscillators begun in Quarterly Report No. 4 is continued. Curves relating the pulling factor, P^2, and the resistance ratio, $-R_1/R_o$, have been computed for more general types of negative-resistance characteristics. The theory has

been applied to the design of a parallel-mode oscillator at 1000 cps. By actual performance tests the theory predicted the frequency stability with respect to supply voltage variations to within a factor of about three and the amplitude stability to within a factor of less than two. Since the measured frequency stability was approximately 15 parts in 10^7 for one per cent change in supply voltage and the analysis involves several approximations, these results are considered to be very good. (See also PB 138 199)

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
TRANSISTOR OSCILLATORS OF EXTENDED FREQUENCY RANGE, by B. J. Dasher, D. L. Finn and others. Quarterly rept. no. 6 on Contract DA 36-039-sc-42712. 30 Dec 54, 32p. 15 refs.
Order from LC mi$3.00, ph$6.30 PB 138 201

A laboratory-constructed temperature test chamber is described, and some data on temperature stability of transistor oscillators, obtained by making use of the test chamber, are presented herein. The best temperature stability obtained is 4 parts in 10^8 for 1^oC temperature change, with an oscillator having a voltage stability of 1 part in 10^8 for a 1 per cent voltage change. This oscillator makes use of a point-contact transistor. Circuit schematics are presented for junction-transistor oscillators having similar orders of stability. (See also PB 138 200)

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
TRANSISTOR OSCILLATORS OF EXTENDED FREQUENCY RANGE, by B. J. Dasher, S. N. Witt, Jr. and W. B. Warren, Jr. Quarterly rept. no. 7 on Contract DA 36-039-sc-42712. 31 Mar 55, 43p. 16 refs.
Order from LC mi$3.30, ph$7.80 PB 138 202

In order to facilitate comparisons among oscillator circuits, the term stability has been defined as a numerical quantity which increases as a circuit is made more stable. Stability may be expressed as a function of any variable parameter, such as voltage or temperature. The use of impedance inversion to obtain crystal control of point-contact oscillators has been found to be impractical in most cases. A transistorized Meacham bridge oscillator has been developed which has performance comparable to a similar oscillator using vacuum tubes. The best stability obtained was approximately 2 parts in 10^9 frequency variation for one per cent voltage change. A design procedure is described which provides a method for obtaining best stability for most feedback-type oscillators. Data are given on a novel method of stabilization of junction-transistor oscillators using distortion control. The problems involved in measuring frequency stability are discussed. (See also PB 138 201)

Goodrich, B. F., Co., Brecksville, Ohio.
NEW POLYMERIC INSULATING MATERIALS, by J. E. Jansen, C. S. Schollenberger and others. Annual summary rept. for 1 Oct 54-30 Sep 55 on Contract DA 36-039-sc-64534. 30 Sep 55, 73p. 8 refs.
Order from LC mi$4.50, ph$12.30 PB 139 008

The present WD-1 twisted pair infantry field wire is fabricated of several strands of wire insulated electrically with polyethylene and covered with an outer jacket of nylon. It is desirable to provide other sources of insulating or jacketing materials equivalent to or superior to the present composition. The purpose of this work is to examine likely polymers as replacements and to investigate the field of polyurethanes in particular. Polyurethane VC-1A, a tough, rubbery, thermoplastic polyesterurethane is under intensive investigation as a candidate.

Hoffman Labs., Inc., Los Angeles, Calif.
TRANSISTORIZED MODIFICATION, AN/PRC-14. Final engineering rept. for 1 Mar 56-28 Feb 57 on Contract AF 30(602)1477. [1957] 93p. 8 refs. RADC-TR-58-35; AD-148 646.
Order from LC mi$5.40, ph$15.30 PB 143 514

The feasibility of replacing certain vacuum tube circuits in the AN/PRC-14 with transistor circuits has been proven. Virtually 100 percent compatibility of circuitry was achieved (except for the AGC circuit compromise). System gain, audio response, power output, bandwidth and shape factor were equal to or better than those of the original equipment employing all vacuum tubes. Some conservation of space was achieved, and a 16 percent reduction in battery power was experienced. Maximum utilization of printed circuitry techniques made possible a unique i-f stage package. Operation at elevated temperatures was satisfactory. A high degree of reliability was demonstrated by the fact that no failures of transistors occurred under normal operating conditions during the program. All factors considered indicate the desirability of transistors in the portable equipment applications, where weight, space and supply power must be restricted to a minimum. Continuing developments in the transistor field indicate that many more functions in equipment such as the AN/PRC-14 (XW-2) may be performed by transistors.

Hughes Aircraft Co., Culver City, Calif.
STUDY OF ATOMIC AND MOLECULAR RESONANCES FOR MICROWAVE GENERATION AND AMPLIFICATION, by R. Hellwarth, R. Hoskins and R. Pastor. Quarterly progress rept. no. 2, 15 Mar-15 June 58, on Contract DA 36-039-sc-74967. [1958] 12p. 4 refs.
Order from LC mi$2.40, ph$3.30 PB 139 226

By use of the ordered operator formalism for analyzing solutions to Shroedinger's equation, a quantum theory of linear dissipative networks is outlined. An operator functional describing a network is defined, and certain of its properties are noted. In tuning the zero-field splitting of a paramagnetic ion by chemical means, a basis for the choice of the complex and host lattice is given. The present activity is centered on Cr^{+3} in two host lattices, viz., the double metal nitrates and the hexacyano complexes. It is found that Cr^{+3} can be substitutionally incorporated in the double metal nitrates with a partition coefficient about an order of magnitude poorer than that for Gd^{+3}. The latter is known to have a partition coefficient which is at least an order of magnitude different from unity. Preparative procedures that have been tried in the

synthesis of the hexacyano complexes are given, and their advantages and disadvantages are discussed. Experimental work has been initiated on the inversion of electron spin populations by pulse methods in order to gain information on relaxation times and saturation behavior.

Hycon Eastern, Inc., Cambridge, Mass.
FREQUENCY TRANSLATOR WITHOUT SYNTHESIZER, by Richard L. Smith. Monthly progress rept. no. 1, 15 Mar-15 Apr 57, on Contract DA 36-039-sc-73191. 30 Apr 57, 14p.
Order from LC mi$2.40, ph$3.30 PB 139 096

Work to date has been limited and largely related to general system design consideration. Conclusions indicate soundness of the basic design as proposed. Procurement has been started on some long delivery components.

Hycon Eastern, Inc., Cambridge, Mass.
FREQUENCY TRANSLATOR WITHOUT SYNTHESIZER, by Richard L. Smith. Monthly progress rept. no. 2, 15 Apr-15 May 57, on Contract DA 36-039-sc-73191. 30 May 57, 13p.
Order from LC mi$2.40, ph$3.30 PB 139 097

Results of study to optimize system parameters on a squelched phase-locked klystron for use in the translator are reported. Progress on construction and test of system components is reported. (See also PB 139 096)

Hycon Eastern, Inc., Cambridge, Mass.
FREQUENCY TRANSLATOR WITHOUT SYNTHESIZER, by Richard L. Smith. Monthly progress rept. no. 3, 15 May-15 June 57, on Contract DA 36-039-sc-73191. 30 June 57, 10p.
Order from LC mi$1.80, ph$1.80 PB 139 098

Progress is reported on construction and test of the squelched phase-locked klystron, frequency multipliers, intermediate frequency amplifier, and crystal discriminator. (See also PB 139 097)

Hycon Eastern, Inc., Cambridge, Mass.
FREQUENCY TRANSLATOR WITHOUT SYNTHESIZER, by Richard L. Smith. Monthly progress rept. no. 4, 15 July 57, on Contract DA 36-039-sc-73191. 31 July 57, 10p.
Order from LC mi$1.80, ph$1.80 PB 139 099

Results of a study on the use of a squelched phase-locked klystron as local oscillator in the translator and progress on other system components is reported. (See also PB 139 098)

Hycon Eastern, Inc., Cambridge, Mass.
FREQUENCY TRANSLATOR WITHOUT SYNTHESIZER, by Richard L. Smith. Monthly progress rept. no. 5, 15 July-15 Aug 57, on Contract DA 36-039-sc-73191. 31 Aug 57, 8p.
Order from LC mi$1.80, ph$1.80 PB 139 100

Progress is reported on circuit development and test of this frequency multiplier, servo amplifier, and the 5 Mc/s crystal oscillator for use in the translator. (See also PB 139 099)

Hycon Eastern, Inc., Cambridge, Mass.
FREQUENCY TRANSLATOR WITHOUT SYNTHESIZER, by Richard L. Smith. Monthly progress rept. no. 6, 15 Aug-15 Sep 57 on Contract DA 36-039-sc-73191. 30 Sep 57, 9p.
Order from LC mi$1.80, ph$1.80 PB 139 105

Progress is reported on the development of a revised system for the Translator which eliminates the necessity for a synchronized local oscillator klystron. (See also PB 139 100)

Hycon Eastern, Inc., Cambridge, Mass.
FREQUENCY TRANSLATOR WITHOUT SYNTHESIZER, by Richard L. Smith. Monthly progress rept. no. 7, 15 Sep-15 Oct 57, on Contract DA 36-039-sc-73191. 31 Oct 57, 11p.
Order from LC mi$2.40, ph$3.30 PB 139 094

A final design-approach proposal for the translator is presented and progress on breadboarding of system components is reported. (See also PB 139 105)

International Resistance Co., Philadelphia, Pa.
RESISTORS, FIXED, HIGH STABILITY, INSULATED, by Sidney J. Stein, John J. Bohrer and others. Quarterly progress rept. no. 2, 15 July-15 Oct 55, on Contract DA 36-039-sc-64665. [1955] 41p.
Order from LC mi$3.30, ph$7.80 PB 129 892

The investigation of materials and methods believed to be capable of leading to low cost, insulated, fixed resistors of high stability was continued. Resistors of the "semi-precision" type having resistance values exceeding the contract requirements in both the high and the low ranges have been made as a result of work conducted to increase the range span of resistance values attainable. Preliminary performance testing results of resistors in the extreme ranges show indication of meeting or exceeding the contract requirements in most respects. In the "precision" phase, work has continued on improved protective coating, insulating molding materials, and termination systems. Contact effects have been reduced to an insignificant level enabling the attainment of stable resistors of lower ranges than were previously made. Temperature coefficients of less than 50 PPM were obtained for units of less than 200 ohms. (See also PB 129 894)

Lavoie Labs., Inc., Morganville, N. J.
THE DEVELOPMENT OF THE FREQUENCY METER AN/URM-80. Final rept. for 29 Feb 52-Jan 54 on Contract DA 36-039-sc-36527. [1954] 44p.
Order from LC mi$3.30, ph$7.80 PB 139 087

The report covers the development of a frequency meter covering from 10 to 100 megacycles, with an accuracy of 0.001%. During the development period,

new components were developed and techniques for calibration and temperature control established. A relatively new system of frequency measurement was applied to a single-unit instrument which resulted in a reduction of ambiguity to the vanishing point. By the use of individual subchassis, each comprising a major system element, manufacture and test of the instrument was simplified, and production lead time was reduced. The large number of calibration points required that standard mechanical calibration methods be discarded and a high speed continuous film strip calibrator be developed.

Lincoln Lab., Mass. Inst. of Tech., Lexington.
STRAIGHT TAPERS IN RECTANGULAR WAVEGUIDES. A COMPARISON OF PRINCIPAL-MODE AND NONUNIFORM TRANSMISSION-LINE THEORIES, by T. J. Rey. Rept. on Contract AF 19(122)458. 10 Feb 58, 13p. 15 refs. Technical rept. no. 174. AD-110 041.
Order from LC mi$2.40, ph$3.30 PB 138 606

Straight tapers of the E-plane, H-plane and pyramidal types in rectangular waveguides are analyzed in terms of principal modes. Comparison with nonuniform transmission-line theory shows considerable agreement. Expressions suitable for numerical computation are presented.

Lincoln Lab., Mass. Inst. of Tech., Lexington.
TRANSISTORIZED MATCHED FILTER FOR PULSED SINUSOIDS, by P. L. Fleck, Jr. Rept. on Contract AF 19(122)458. 12 Apr 57, 27p. 14 refs. Technical rept. no. 156; AD-147 492.
Order from LC mi$2.70, ph$4.80 PB 138 607

A matched filter for pulsed sinusoidal symbols has been designed and constructed in which transistors are used as the active elements. The filter has a gain variation of less than one db as a result of variation of component parameters, temperature, age, and supply voltages. The filter has a useful dynamic range of at least 80 db.

Litton Industries, College Park, Md.
SURFACE WAVE ANTENNA STUDY, by W. P. Hooper and E. A. Wolff. Final rept. on Contract AF 19(604)3457. 28 May 59, 29p. 2 refs. AFCRC TR-59-159; AD-217 074.
Order from LC mi$2.70, ph$4.80 PB 143 355

The purposes of the project were to study methods of increasing the efficiency of the dielectric image line antenna and the development of a method of launching the image transmission line mode with a flush launcher. Investigations were made to determine the efficiency of the antenna and ways of improving the efficiency. Also, methods of launching the transmission line mode with a flush launcher, which would eliminate the horn launcher, were investigated. A number of patterns for the flush launcher are included.

Mallory Battery Co., North Tarrytown, N. Y.
HEATING AND INSULATION OF ALKALINE DRY BATTERIES FOR LOW TEMPERATURE OPERATION, by Michael Firshein and Herman Schiebler. Final rept. pt. 1, 10 May 56-10 Feb 58, on Contract DA 36-039-sc-72372. [1958]. 71p.
Order from LC mi$4.50, ph$12.30 PB 139 060

The contract for the manufacture of alkaline dry batteries embodying the principles of heating and insulation for low temperature operation comprises six tasks. Task A, calls for a replacement for Battery BB-401/U. Task B calls for the manufacture of Battery Type 6 (Crash Locator Beacon). This Final Report #1 is limited to Tasks A and B.

Mallory, P. R., and Co., Inc., Indianapolis, Ind.
RESISTORS, FIXED, ULTRA-HIGH TEMPERATURE, RADIATION RESISTANT, by David R. Sivertsen. Rept. on Improved Electronic Components, Contract AF 33(616)3643. July 59, 47p. 3 refs. WADC Technical rept. 59-270; AD-215 857.
Order from OTS $1.25 PB 161 081

This report covers the development of a suitable design for a one watt resistor capable of operation at temperatures from -65°C to +500°C in nuclear radiation environments for extended periods of time. The work was devoted to refining the electrical properties and design of the resistor. It was demonstrated that high alumina ceramics were necessary to minimize large non-uniform resistance changes occuring over uniform temperature increments to +500°C. A number of terminal material compositions were examined for applicability in ultra-high temperature operation. Investigation of various metal oxide films revealed that a 7.5% Sb_2O_3: 92.5% SnO_2 composition possessed a near zero temperature coefficient of resistance over broad temperature range and the most desirable electrical characteristics. A suitable insulating coating, composed of flame deposited aluminum oxide, was utilized in this application without undesirable effects on resistor properties. Radiation tests were made on a variety of modified tin oxide resistors at +500°C for 1500 hours under high intensity nuclear radiation.

Michigan U. [Research Inst.] Ann Arbor.
PACKAGED ELECTRIC TUNED 35-200 MC PANORAMIC RECEIVER, by T. W. Butler, Jr. Technical rept. no. 71 on Contract DA 36-039-sc-63203. July 57, 81p. 12 refs. AD-141 657.
Order from LC mi$4.80, ph$13.80 PB 142 696

A method of utilizing the voltage tuning characteristics of ferroelectric capacitors in a packaged, wide-range, superheterodyne, electric-tuned, panoramic receiver is described. This receiver employs titanate ceramic capacitors as tuning elements in the tank circuits of the RF, mixer, and local oscillator stages. The capacity of the tuning elements is varied by changing the electric field applied to the capacitors. The receiver is designed for use in monitoring communication signals in the frequency range 35-200 Mc. This Packaged Electric Tuned Receiver PANoramic (Petr Pan) is the result of a development program designed to indicate the direction engineers can take in developing and packaging a dielectric tuned receiver suitable for operational use.

Michigan U. Research Inst., Ann Arbor.
STUDY OF CIRCUIT APPLICATIONS OF SOLID STATE DEVICES TO ECM EQUIPMENT, by T. W. Butler, Jr., H. Diamond and others. Progress rept. no 18, 1 July 56-1 Jan 57, on Contract DA 36-039-sc-63203. Feb 57, 32p. 5 refs. 2262-142-P; AD-135 755.
Order from LC mi$3.00, ph$6.30 PB 143 643

New ceramic compositions have been developed by the Solid State Devices Laboratory which have much higher Q's and better voltage breakdown characteristics than previously used compositions. Methods of prestressing or "polarizing" ferroelectric samples have been investigated.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
COUPLED LEAKY WAVEGUIDES I: TWO PARALLEL SLITS IN A PLANE, by S. Nishida. Rept. on Contract AF 19(604)2031. 14 May 59, 25p. 2 refs. Research rept. R-732-59; PIB-660; AFCRC TN-59-375; AD-217 855.
Order from LC mi$2.70, ph$4.80 PB 143 024

The longitudinally slitted rectangular waveguide, with radiation characterized by leaky waves, has already been investigated by employing a transverse network representation and a perturbation procedure to solve the resulting network resonance problem. The above investigation has been carried out for a single (isolated) leaky waveguide. In this paper, two coupled leaky waveguides carrying the H_{10} leaky wave are treated for the case where they are arranged in a plane and in parallel with each other.

Minneapolis-Honeywell Regulator Co., Minn.
POWER TRANSISTOR CIRCUITRY, by John T. Lingle. Final rept. for 15 Feb-15 May 57 on Contract DA 36-039-sc-71161. [1957] 124p. Serial no. 12355; AD-156 177.
Order from LC mi$6.30, ph$19.80 PB 143 304

Power transformers utilizing various core materials and cross-sectional areas were tested. Two identical transformers fabricated from 1-mil Deltamix failed to oscillate in the converter. Rapid switching was obtained with transformers fabricated from 2 toroidal core materials, grain-oriented silicon steel, and Ferramic H. Experimental results showed that the addition of secondary leakage inductance can improve the oscillator switching characteristics when the proper filter configuration is used. A large amount of secondary leakage inductance must be incorporated in the transformer for good switching characteristics. Some transformer core materials require a greater amount of secondary leakage inductance than others to obtain the desired short switching time. The effects were studied of leakage inductance in producing forward and inverse collector currents during switching. Initial current surges in the switching on transistor could occur when both transistors were conducting at the same instant. Capacitor input load filters produced better switching characteristics than did choke inputs. Determination of transistor output characteristic curves by a pulsing method revealed that the thermal irregularities found in previously determined characteristic curves were reduced by the pulsing method of testing.

Motorola, Inc., Phoenix, Ariz.
INDUSTRIAL PREPAREDNESS STUDY ON DIFFUSED SEMICONDUCTOR DEVICES. Final feasibility rept. on Contract DA 36-039-sc-72694. 6 June 57, 47p. AD-155 228.
Order from LC mi$3.30, ph$7.80 PB 128 771

Diffusion techniques were used in fabricating semiconductor devices for some specific applications. Diffused base-jet plated emitter and collector junction transistors were developed for meeting the requirements for a Ge transistor 12.5-mc amplifier and a Ge transistor video amplifier having a bandwidth of 6 mc. An analysis was made of the electrical characteristics of each transistor device. The units made by the diffused base-jet-etch process will meet the requirements. (See also PB 137 163)

Naval Civil Engineering Lab., Port Hueneme, Calif.
DEVELOPMENT OF A BRUSHLESS REGULATED AC GENERATOR OF RADIO-INTERFERENCE-FREE DESIGN, by A. Mason Brown. Final rept. 7 Sep 59, 58p. 3 refs. Technical rept. 032; AD-209 529.
Order from OTS $1.50 PB 161 104

This report describes the development of a generator of radio-interference-free design which produces a conventional voltage-regulated output without requiring brushes, commutator, or slip rings. There are no sliding or arcing contracts to initiate radio-interference. The unique feature developed is the manner in which regulated excitation is supplied to the rotating field. Acceptance tests showed that the generator compiled with Navy voltage regulation specifications. NCEL tests showed that it was radio-interference-free to MIL-I-16910 standards. Total running time to date logged on the generator is 1600 hours. It is concluded that brushless generators with standard performance characteristics can be built with all sliding, current-carrying surfaces eliminated. Such machines have inherent in their design prospects for a degree of highly reliable operation unattainable in conventional generators.

Naval Ordnance Lab., White Oak, Md.
BEHAVIOUR OF POWDERED AND FLAKE MAGNETIC CORES AT TEMPERATURES UP TO 500°C, by John F. Haben and Edmond Adams. 17 Oct 57, 22p. 5 refs. NAVORD rept. 5752; AD-149 999.
Order from LC mi$2.70, ph$4.80 PB 138 614

The magnetic characteristics of seven high permeability (55-300) powdered and flake core materials were measured at 50°C temperature intervals up to 500°C. None of the cores tested were stable for operation at elevated temperatures. The copper conductor material and its insulation appears to be the limiting factor for continuous 500°C operation.

Naval Ordnance Lab., White Oak, Md.
AN EXPERIMENTAL STUDY OF UNDERWATER ELECTRIC ANTENNA IMPEDANCES, by A. Silverstein and F. G. Salton. 16 Sep 58, 18p. 2 refs. NAVORD rept. 6064.
Order from LC mi$2.40, ph$4.40 PB 143 338

The input impedance of a variety of underwater electric antennas was measured in Chesapeake Bay and in a high conductivity salt pool over a frequency range of 5 - 70 KC. The results were compared with input impedances calculated from a theory based upon the transmission line approach. The deviation of the measured input impedances from the theoretical values is considerable, particularly for short antennas. A qualitative explanation is given for the failure of the transmission line theory. Recommendations are made for communication at increased depth.

Naval Research Lab., Washington, D. C.
A DIRECT-READING SIX-DECADE PRECISION FREQUENCY GENERATOR, by J. E. McGeogh and G. K. Jensen. Interim rept. 25 Nov 58, 12p. 7 refs. Rept. 5224.
Order from OTS $0.50 PB 151 158

The development of a direct-reading six-decade frequency generator to be used in conjunction with a previously reported direct-reading frequency meter has been satisfactorily completed. This new frequency generator has been made with unitized construction to overall dimensions of 12-3/4 x 14-1/2 x 5-3/4 in., or 0.615 cu ft, and utilizes miniature tubes, but the size could be reduced appreciably in a subsequent model. Each of 6 plug-in decade chassis has 3 tubes, for a total of 18 tubes, and the reference-frequency section, composed of 11 small plug-in chassis, has a total of 29 tubes. In the next model the number of tubes could be reduced to 6 and 20, respectively. All decades have identical schematic diagrams, but different tuning is necessary to operate in the three required frequency ranges. The mechanical construction is identical in all decades. The decade frequency generator is accurate to within about one part in 100 million when an external reference frequency of the same accuracy is available, or to one part per million when the reference frequency is internally generated by a temperature-controlled crystal oscillator with one part per million accuracy. The reduction in size from previous models of decade generators is accompanied by a reduction in weight and also by an appreciable reduction in power requirements, which further reduces the size and weight of the power supply. As a result of this development, the entire frequency meter, consisting of the direct-reading six-decade frequency generator, frequency multipliers, and comparison circuits and filters, may be contained in a unit of one cubic foot.

Navy Electronics Lab., San Diego, Calif.
DEVELOPMENT OF A 36-FOOT FOLDED PILLBOX INTERROGATOR ANTENNA FOR THE AIRWAYS MODERNIZATION BOARD, by B. T. Birkett. 5 Nov 58, 23p. 4 refs. Research and development rept. 878.
Order from LC mi$2.70, ph$4.80 PB 139 081

A folded pillbox antenna has been designed, built, tested, and sent to the CAA Technical Development Center, Indianapolis, Indiana, for further testing with other components of the Airways Modernization Board beacon system. The antenna is 36 feet wide, 3 feet high, and 10 feet deep. It weighs approximately 1000 pounds. The azimuth beamwidth is 2 1/4°, the wide-angle side lobes are below 29 db, and the gain is 26 db.

New York U. Coll. of Engineering, N. Y.
SEALING TECHNIQUES FOR WAVEGUIDE AND COAXIAL ROTARY JOINTS, by Milton M. Backman, Michael B. Maccarone and Fred H. Posser. Rept. no. 10 (Final) for 1 Aug 54-31 Mar 57 on Contract DA 36-039-sc-64476. [1957] 170p. 52 refs. AD-156 901.
Order from LC mi$7.80, ph$25.80 PB 143 303

This report contains information regarding all phases of the experimental work undertaken in the determination of a design criteria for development and application of sealing techniques to be applied to waveguide and coaxial rotary joints. The first part of this report is devoted to the results of experimental and development work performed in producing the final design and construction of sealed RG-52 waveguide rotary joints. The second portion of the report contains five Appendices. The first is devoted to the experimental work on the magnetic fluid and the magnetic mechanical seals. The second appendix is a history with recorded data of the experimental work performed in the development of the final design. Reference is made to the work with the first experimental mechanical seal and continues through to the final development results. The third appendix refers to publications, reports, lectures, and conferences associated with this study. In order to coordinate the design information obtained in this study the fourth appendix of this report presents the developed design criteria with a procedure for designing additional rotary seals with similar requirements to the RG-52 Sealed Rotary Joint developed in this study. The fifth and last appendix presents a major portion of the test data recorded during the final testing of the development models indicating various tests performed with the models including those required by the technical requirements.

Pickard and Burns, Inc., Needham, Mass.
THE IMPROVEMENT OF SIGNAL-TO-NOISE RATIOS OF THE COZI EQUIPMENT, by Walter Kostecki. Interim status rept. for 1 Dec 57-31 Mar 59 on Contract AF 19(604)1502. 30 Apr 59, 11p. P&B Pub. no. 528; AFCRC-TN-59-191; AD 215 623.
Order from LC mi$2.40, ph$3.30 PB 143 560

See also PB 136 212

Pickard and Burns, Inc., Needham, Mass.
THE IMPROVEMENT OF SIGNAL-TO-NOISE RATIOS OF THE COZI EQUIPMENT, by L. Dennis Shapiro. Final rept. on Contract AF 19(604)1502. 17 July 59, 20p. 1 ref. P&B Pub. no. 549; AFCRC-TR-59-175.
Order from LC mi$2.40, ph$3.30 PB 143 491

Philco Corp., Philadelphia, Pa.
RESEARCH AND EXPERIMENTAL WORK ON MICROWAVE TRANSISTORS, by R. L. Goldman, G. P. Oppo and others. Quarterly progress rept. no. 2, 15 Apr-15 July 58, on Theoretical and Experimental Investigation of New Semiconductor Devices for Operation in the 2 to 10 Kilomegacycle Range, Contract DA 36-039-sc-74988. [1958] 30p. 9 refs. Philco no. 2153-2.
Order from LC mi$2.70, ph$4.80 PB 139 065

Wafer-type depletion layer devices have been fabricated in order to investigate injection into the depletion layer. A theoretical analysis of both high- and low-frequency operation has been initiated to determine the feasibility of a depletion layer transistor as a high-frequency device. Results indicate that the fabrication problems will be the principal barrier to the development of a feasible device. The results of a study concerning the fabrication and evaluation of bar-type, wafer-channel, and surface-barrier analog devices indicate that the surface-barrier device has the most favorable and reproducible characteristics, and is the easiest to fabricate. A theoretical analysis has also been initiated to determine the feasibility of the analog transistor for high-frequency application. Early results indicate that the field-effect unipolar device is extremely flexible.

Puerto Rico U., Mayaguez.
CHARACTERISTICS OF A PECULIAR BACK-SCATTER ECHO OBSERVED AT A FREQUENCY OF 21.6 mc. p.s., by B. Dueno. Research rept. no. 1 on Contract AF 49(638)172. [1958] 27p. 2 refs. AFOSR TN-59-40; AD-209 212.
Order from LC mi$2.70, ph$4.80 PB 139 212

Inspection of records of a backscatter experiment performed at the University of Puerto Rico at Mayaguez has revealed a very interesting echo which as yet has not been observed at back-scatter stations located on higher latitude sites. This echo takes the form of a narrow thin line reflection extending in all directions with its slant range practically independent of its azimutal bearing. The bottom edge of the line is believed to be due to a focussing effect of the minimal time delay type proposed by A. M. Peterson in 1951 while the upper edge is due to a focussing effect between the skip distance rays and rays at greater angles of incidence having the same time delays as the skip distance rays. At the frequency of operation, 21.6 mc. it is observed by itself at times when the attenuation of the radio waves is at its highest. The range assumes values between 1000 and 2000 kilometers depending on time of the day and season.

Radio Corp. of America, Lancaster, Pa.
DEVELOPMENT OF A RUGGEDIZED VIDICON AND DEFLECTION COMPONENTS, by F. D. Marschka. Rept. on Electronic Tubes and Transistors, Contract AF 33(600)32346, July 59, 31p. WADC Technical rept. 59-329.
Order from OTS $1.00 PB 161 082

Extensive operational vibration and temperature-altitude tests along with non-operational impact shock and temperature-humidity tests led to the design and development of the RCA C73453D vidicon and RCA XD3010A deflection assembly. Results of these tests indicated compliance with the environmental requirements of the contract.

Research Lab. of Physical Electronics, Tufts [U.] Medford, Mass.
STUDIES ON PIEZOELECTRIC RESONATORS, by C. R. Mingins, R. W. Perry and others. Quarterly rept. no. 2, 15 July-15 Oct 54, on Contract DA 36-039-sc-56764. 15 Nov 54, 23p. 3 refs.
Order from LC mi$2.70, ph$4.80 PB 138 694

Spectra of thickness-shear and flexural modes and the spectra predicted by an approximate theory. Methods of adjusting the experimental results to a basis comparable with the theoretical presentation.

Research Lab. of Physical Electronics, Tufts U., Medford, Mass.
STUDIES ON PIEZOELECTRIC RESONATORS, by C. R. Mingins, R. W. Perry and others. Final rept. on Contract DA 36-039-sc-56764. 1 Nov 55, 35p. 8 refs.
Order from LC mi$3.00, ph$6.30 PB 138 825

Explorations in frequency and dimension to obtain the experimental curves of flexural and thickness-shear modes of vibration in a piezoid having the form of a rectangular parallelepiped with very small tolerances, in order to establish the empirical functions against which theory must be checked.

Rome Air Development Center, Griffiss AFB, N. Y.
FEASIBILITY STUDY OF MONOLITHIC FOAM-IN-PLACE RADOME, by Joseph Schramp and Robert Curtis. Oct 58, 24p. 4 refs. RADC-TN-58-253; AD-202 094.
Order from LC mi$2.70, ph$4.80 PB 138 620

Equipment and procedures used in the erection at RADC of a monolithic foam-in-place radome are presented; problem areas are outlined and feasible solutions suggested. In the Appendix the results of a structural analysis of the monolithic foam shell are summarized.

Rome Air Development Center, Griffiss AFB, N. Y.
AN INTEGRATED APPROACH TO THE DESIGN OF MOBILE TACTICAL ELECTRONIC SYSTEMS, by Robert N. Skalwold and Maurice N. Scheiderich. Oct 58, 45p. RADC-TN-58-260; AD-148 917.
Order from LC mi$3.30, ph$7.80 PB 138 619

This report compares the complete conventional system weight of the lightest radar the state of the art has produced with the weight of a completely integrated system. The results show that the integrated system will weigh approximately one-third the weight of the conventional system. Recommendations for application to tactical ground electronics sub-systems are included.

Rome Air Development Center, Griffiss AFB, N. Y.
RADAR VISUAL INTERFERENCE TESTS, by Sheldon Kustin. Aug 57, 18p. 2 refs. RADC-TN-57-251; AD-131 173.
Order from LC mi$2.40, ph$3.30 PB 129 888

Presented in this report are various types of radar-to-radar visual interference, a description of tests performed, and some recommended solutions to the problem of visual interference.

Rome Air Development Center, Griffiss AFB, N. Y.
SEMI-AUTOMATIC SWITCHING FOR FLEXOWRITER MACHINES, by James F. Greenly. Nov 58, 14p. RADC-TN-58-289; AD-148 957.
Order from LC mi$2.40, ph$3.30 PB 138 618

The equipment described in this report fulfills the requirement for switching multiple Flexowriter machines in a local network. Adequate circuits are provided to allow simultaneous communication between machines in a variety of switched combinations. Design considerations, power requirements, and operational features are discussed. Operation of line selection circuits is described in detail.

Scintilla Div., Bendix Aviation Corp., Sidney, N. Y.
IMPROVED CONNECTOR DESIGN: SERVICES, FACILITIES, AND MATERIALS TOGETHER WITH CONNECTOR SAMPLES, by L. J. Elliott. Final rept. for 15 Oct 50-15 May 54 on Contract DA 36-039-sc-42542. 15 June 54, 310p. 35 refs.
Order from LC mi$11.10, ph$37.10 PB 142 954

Exhaustive investigation of connectors designs incorporating the latest concepts in quick connect-disconnect features, positive contact action, miniaturization, watertightness, insert materials, aluminum finishes, and other factors which would augment their reliability in military service. Sufficient design criteria were to be established to replace the present AN connectors.

Speech Research Lab., U. of Michigan, Ann Arbor.
SEGMENTATION TECHNIQUES IN SPEECH SYNTHESIS (PART I) [AND] SEGMENT INVENTORY FOR SPEECH SYNTHESIS (PART II) by William S-Y. Wang, Gordon E. Peterson, and Eva Sivertsen. Rept. no. 1 on Contract Nonr-1224(22). May 58, 31p. 6 refs.
Order from LC mi$3.00, ph$6.30 PB 138 816

A basic method of speech synthesis is described in which discrete segments of recorded utterances are joined together to produce continuous speech. The method of synthesis described includes not only articulatory phones, but also intonation, stress, and duration. Various techniques of obtaining segments for speech synthesis are discussed. The inventory of segments required to synthesize an idiolect of American speech from recorded utterances has been partially investigated. A total of 43 phonetic units, including a unit of silence, is found essential. These units represent some of the major allophones of the phonemes of the idiolect. To obtain the segments, utterances are constructed with the desired sequence of the two phonetic units and with the proper intonation and stress environment. The utterances are recorded on magnetic tape, and the desired boundaries of the segments are determined by means of a technique employing a sound spectrograph. An attempt is made to match harmonics, formants, and amplitude envelopes between adjacent segments. To synthesize the idiolect it is estimated that an inventory of about 8,000 segments is required. A sentence synthesized from over 40 such segments is demonstrated.

Stanford Electronics Labs., Stanford U., Calif.
FREQUENCY MIXING IN MICROWAVE BEAM-TYPE DEVICES, by R. W. Degrasse. Rept. on Contract AF 19(604)1847. 28 July 58, 188p. 34 refs. Technical rept. no. 386-2.
Order from LC mi$8.40, ph$28.80 PB 139 124

This report is primarily concerned with the frequency mixing effects which occur in microwave electron-beam type devices. The theoretical portion of the study is devoted to obtaining a better understanding of the nature of the non-linear effects which can be introduced into or are already present in velocity-modulated electron beams.

Stanford Electronics Labs., Stanford U., Calif.
MULTI-STAGE, NARROW-BAND AMPLIFIERS EMPLOYING NON-UNILATERAL ELECTRON DEVICES, by M. Lim. Technical rept. no. 27 on Contract Nonr-225(24). 11 Feb 58, 121p.
Order from LC mi$6.30, ph$19.80 PB 138 708

This paper presents a method for the design of multi-stage, narrow-band amplifiers employing general active two-port devices as amplifying elements. The stability of the amplifier is controlled by means of its input and output conductance levels, rather than by neutralization. The main characteristic of this paper is a theoretical exposition of the functional dependence of the transducer gain of a multi-stage, narrow-band, iterative amplifier upon its interstage network, and upon the input and output terminations. A complete analysis of the transducer gain of the amplifier is presented.

Stanford Electronics Labs., Stanford U., Calif.
TWO WIDEBAND VIDEO TECHNIQUES FOR MICROWAVE DETECTORS, by J. C. de Broekert. Rept. on Contract DA 36-039-sc-73151. 27 Nov 57, 19p. Technical rept. no. 152-2; AD-149 509.
Order from LC mi$2.40, ph$3.30 PB 143 306

This report describes two techniques for achieving a wide video bandwidth in a microwave crystal detector and associated input video amplifier. In each case, forward current bias is used to reduce the crystal video resistance to a reasonably low value. The techniques differ in the manner in which a low effective interstage capacitance is achieved. In the guard-electrode mount, the interstage video capacitance is split into a three-capacitor delta configuration by modification of the detector mount. The additional node thus formed is driven with a near-unity-gain amplifier. Measurements of VSWR, video voltage, tangertial signal sensitivity and bandwidth are presented for this mount before and after modification. The capacitance-

neutralized input circuit may be used with any crystal mount. A feedback amplifier is used to place an effective negative capacitance in parallel with the existing interstage capacitance. One secondary-emission tube is used in the feedback amplifier.

Stanford Research Inst., Menlo Park, Calif.
DESIGN DATA FOR ANTENNA-MULTICOUPLER SYSTEMS, by J. F. Cline. Scientific rept. 3 on Contract AF 19(604)2247. Sep 58, 24p. 5 refs. AFCRC-TN-58-139; AD-146 900.
Order from LC mi$2.70, ph$4.80 PB 138 601

This is the third in a series of reports on the design of antenna-multicoupler systems for use where several transmitters and receivers are operated simultaneously with a single antenna system. The design formulas for the two- and three-resonator, tunable, narrow-band, symmetrical, minimum-loss, capacitively coupled filters developed in the two previous reports are adapted to the design of inductively coupled filters in the present report. With either type of coupling, the way in which the filter element values must vary with frequency is shown to depend upon the method of tuning employed in the resonators. Three resonator tuning methods are considered, in which either C, L, or the ratio C/L is taken as a parameter. Tables of filter design formulas are given which apply when any of the three resonator tuning methods is used. Shorter, approximate filter design formulas are given which are reasonably accurate for minimum center-frequency insertion-loss values up to about 1 db.

Sylvania Electric Products, Inc., Bayside, N. Y.
HEATER-CATHODE LEAKAGE INVESTIGATION, by Julius Cohen and J. V. Florio. Final rept. on Contract AF 19(604)1734. 15 May 58, 163p. 33 refs. Rept. no. YD 57-5-8; AFCRC-TR-58-163; AD-152 448.
Order from LC mi$7.80, ph$25.80 PB 138 799

Syracuse U. Research Inst., N. Y.
EFFECT OF SURFACE REFLECTIONS ON RAIN CANCELLATION OF CIRCULARLY-POLARIZED RADARS, by Richard McFee and Thomas M. Maher. Task rept. no. 2 on Contract AF 30(602)1640. 5 Nov 57, 15p. 1 ref. SURI rept. no. EE492-4711T2; RADC-TN-58-51; AD-148 601.
Order from LC mi$2.40, ph$3.30 PB 143 488

Theoretical estimates of the reduction in cancellation are presented using acutal reflection coefficients of sea water at 500 and 3000 mc. Cancellation of rain returns of circularly-polarized ground-based radars did not exceed 15 to 18 db, with the 3-db point of the antenna pattern on the horizon and a 6° vertical beam width, because of surface reflections. Cross-linear polarization cancellation is not disturbed by these reflections and offers these advantages: (1) the use of a power divider or a phase shifter is not required, (2) the radar duplexer may work at lower peak currents, (3) the means for switching from cross-linear to normal radar operation are easier, and (4) loss of target cross section is about 3 db less than that for circular polarization. The following techniques can help suppress return from rain: (1) narrower beamwidth, (2) shorter pulses, (3) lower RF, (4) velocity filtering of low speed returns, and (5) sensitivity time control.

Syracuse U. Research Inst., N. Y.
A STUDY OF MARKER INSERTION TECHNIQUES FOR PLAN POSITION INDICATORS, by G. M. Glasford, H. Hellerman and others. Final rept. on Contract AF 30(602)300. 1 Aug 54, 294p. 2 refs. RADC-TR-55-357; AD-71 405.
Order from LC mi$11.10, ph$45.60 PB 143 490

A detailed study of the problem of marker insertion in PPI displays has been carried out with particular emphasis on the long range system operating at low PRF and large sweep duty cycles. A basic analysis and comparison of PPI types is first made and the more conventional range and azimuth measuring techniques discussed. These techniques refer primarily to the electronic range strobe in combination with either electronic or mechanical azimuth cursors. Errors involved in both range and azimuth determination are analyzed. Techniques of sweep-time sharing for video and marker information are discussed and related both to the range strobe-azimuth cursor presentation and the presentation of single markers of circular or other shape. Problems of accuracy in the single marker type are analyzed. The flashing cursor and its limitations are discussed. Consideration is given to the use of the between-sweep interval for the insertion of markers of various types. Electronic switching arrangements for multiple markers were developed.

Syracuse U. Research Inst., N. Y.
STUDY OF PHASE-ERROR AND TOLERANCE EFFECTS IN MICROWAVE ANTENNAS, by David K. Cheng and Richard E. Gildersleeve. Final rept. for 10 Dec 53-31 Dec 55 on Contract AF 30(602)924. 31 Jan 56, 128p. 18 refs. SURI rept. no. EE276-564F; RADC-TR-58-50, AD-148 677.
Order from LC mi$6.30, ph$19.80 PB 143 496

The effects of different types of phase errors in the aperture plane on the characteristics of the radiation pattern are determined, and the geometrical deviations of the reflector are correlated with the phase errors. The general effects of aperture phase errors are to raise the side-lobe level, to widen the main-lobe beamwidth, and to reduce the antenna gain. A formula is presented for the maximum fractional reduction in gain when the peak phase error is known, but the exact amplitude or phase distribution function in the aperture is unknown. Another formula expresses the maximum change in beamwidth for rectangular and circular apertures when the exact phase distribution function is unknown and the peak phase error is known. The rise in the side-lobe level depends upon both the amplitude illumination function and the type of phase error. For the $\cos^2(0.375\pi x)$ tapered amplitude function, the rise in the side-lobe level for the rectangular aperture case is more than that for the circular aperture case for the same types of phase errors, although the first side lobes for the former case (25.90 db down) are higher than those for the latter case (28.00 db down) when there is no phase error.

Syracuse U. Research Inst., N. Y.
A STUDY OF TRANSISTOR LINEAR TIME DELAY CIRCUITS, by R. P. Nanavati. Final rept. on Transistor Circuit Applications, Contract AF 30(602)1626. Dec 57, 68p. 5 refs. SURI rept. EE 466-5712F; RADC-TR-58-70; AD-148 738.
Order from LC mi$3.90, ph$10.80 PB 143 526

This report concerns itself with the study of a transistor emitter-coupled monostable multivibrator the duration of whose output pulse can be controlled linearly by the setting of the potentiometer at the input. This circuit can be used as a linear delay circuit or as a gate in its own right. It can also serve as an important "building block" for linear time base circuits.

Syracuse U. Research Inst., N. Y.
TRANSISTOR VIDEO AMPLIFIERS, by Carl R. Zimmer. Final rept. on Transistor Circuit Applications, Contract AF 30(602)1026. Nov 57, 209p. 28 refs. SURI rept. EE466-5711F; RADC-TR-58-99; AD-148 816.
Order from LC mi$9.30, ph$31.80 PB 143 495

Basic low pass amplifier theory: Vacuum tube amplifiers, and 2- and 4- terminal interstage networks. Theoretical equivalent circuits: Fused-junction transistor, effect of the base spreading resistance, transistor parameters in the grounded-emitter connection, approximations for transistor parameters, relations among design and circuit parameters, fabrication of fused- and grown-junction transistors, and modified junction transistor designs. Measurement of transistor parameters: Simplified equipment for h-parameter measurements, measurement of transistor parameters using bridge techniques, and experimental results for the fused- and grown-junction transistors. Single stage amplifier: Simplified equivalent circuit, amplifier stage with resistive terminations, input circuit compensation (series peaking), effect of load capacitance, output circuit equalization, and compensation using local RC feedback. Multistage amplifiers: Shunt resistance interstage, shunt peaking (simple RL network), 4-terminal networks and all-pole transfer functions, and ultimate limitations of interstage compensating network. Large signal operation: Effect of the transistor output impedance, output circuit equalization, addition of feedback equalization, and experimental results using feedback equalization. Appendixes: Approximations for transistor parameters, measurement of circuit parameters for surface barrier transistors, and maximally flat transfer functions.

Mechanical Engineering

Bureau of Yards and Docks, Washington, D. C.
POWER GENERATION AND DISTRIBUTION. CHAPTER 2. MOBILE EMERGENCY POWER PLANTS. 15 May 54, 70p. Technical pub. NAVDOCKS TP-Pu-3.
Order from OTS $1.75 PB 161 056

This Technical Publication gives technical criteria for mobile emergency power plants, including the maintenance and operation of these plants, emergency electric generator equipment, steam railway power plants, and mobile as well as portable diesel-electric generating plants.

Bureau of Yards and Docks, Washington, D. C.
POWER GENERATION AND DISTRIBUTION. CHAPTER 3. FUELS. 3 June 59, 140p. 17 refs. Technical pub. NAVDOCKS TP-Pu-3; BUDOCKSINST 11310.16.
Order from OTS $2.75 PB 161 058

This Technical Publication is divided into three parts, namely, solid, liquid, and gaseous fuels. These are treated as they are utilized in the Shore Establishment and as existing and development policy influences their selection. Purely technical and detailed information is avoided, except in policy matters. (See also PB 161 054)

Bureau of Yards and Docks, Washington, D. C.
POWER GENERATION AND DISTRIBUTION. CHAPTER 4. POWER PLANT WATER CONDITIONING. 15 Dec 53, 112p. 2 refs. Technical pub. NAVDOCKS TP-Pu-3; BUDOCKSINST 11310.4 CH1.
Order from OTS $2.50 PB 161 055

This Technical Publication covers the design, construction, operation, and maintenance of power plant water conditioning systems. The design and construction part covers in detail chemical analysis, feedwater treatment, treatment plants, secondary internal treatment, and laboratory and testing equipment. The operation and maintenance part includes external treatment plants, secondary treatment, chemical testing procedures, care of idle boilers, prevention of return-condensate corrosion, safety precautions, and records and reports. (See also PB 161 058)

Bureau of Yards and Docks, Washington, D. C.
POWER GENERATION AND DISTRIBUTION. CHAPTER 9. DISTRIBUTION OF STEAM, HIGH-TEMPERATURE WATER, AND COMPRESSED AIR. 1 June 54, 33p. 9 refs. Technical pub. NAVDOCKS TP-Pu-3.
Order from OTS $1.00 PB 161 057

This Technical Publication covers the design, construction, operation, and maintenance of steam, high-temperature water, and compressed air distribution systems. The design and construction of each system are analyzed in separate parts of the chapter. Specific types of overhead and underground systems are discussed. Applicable load assemblies, routes, and pressures are presented. The discussion on maintenance and operation is primarily concerned with overhead and underground distribution systems, and with the traps, valves, fittings, and piping that make up these systems. Inspection and safety precautions are discussed as applicable. (See also PB 161 055)

Utah U. Coll. of Engineering, Salt Lake City.
A STUDY OF THICK-WALLED CYLINDERS AS TENSILE MEMBERS FOR HIGH PRESSURE VESSELS, WITH PARTICULAR ATTENTION TO STEELS AND THEIR HEAT TREATMENT FOR MAXIMUM PERFORMANCE, by William A. Boyd and S. S. Kistler.

Technical rept. 3 on Contract Nonr-1288(02). Mar 58, 109p. 24 refs.
Order from LC mi$5.70, ph$16.80 PB 139 183

Contents:
Experimental procedure
Steels used
Calculation of internal pressure from force on the arbor, arbor angle and coefficient of friction
Experimental results with 1-inch rings
Tests of thick rings

Ordnance, Missiles, and Satellite Vehicles

Air Force Missile Test Center, Patrick AFB, Fla.
IN-FLIGHT IMPACT AND APOGEE COMPUTATIONS FOR VANGUARD, by Hallett H. Germond. Rept. on Missile Test Project, Contract AF 08(606)1156. 25 May 59, 99p. 15 refs. RCA Data Processing Technical rept. no. 49; AFMTC-TR-9; AD-216 293.
Order from LC mi$5.40, ph$15.30 PB 143 020

The range, azimuth, and elevation of a Vanguard vehicle, as determined every 0.1 sec by one or another of 2 radars, are used as input to a computer. Every tenth of a second during the powered first and second stages of flight a prediction is made as to where the vehicle would impact if the thrust were to be terminated. This information is displayed continuously on a plotting board. After burnout or cutoff of the second stage, computations are made (every tenth of a second) of the time remaining before the vehicle should reach apogee. This and other information pertinent to the initiation of the third stage is displayed on a console.

Army Signal Research and Development Lab., Fort Monmouth, N. J.
DRAG-CORD ANEMOMETER, by Raymond Bellucci. 15 Sep 58, 39p. 5 refs. USASRDL Technical rept. 1979.
Order from LC mi$3.00, ph$6.30 PB 139 076

An anemometer has been developed which provides a weighted integrated wind over a path. This development was necessitated by the requirement for a weighted, integrated wind measurement over the initial sensitive portion of a rocket trajectory. Two components of the wind force on a long length of stainless steel wire are obtained by measuring the displacement of the wire at one end while the other is held fixed. The wire is placed in a line parallel to the rocket trajectory. By this means the two components of the wind that are determined are the same two components that affect the rocket flight. The equipment has been tested by fixing it vertically at the Oakhurst tower where wind measurements were compared to those from a set of conventional anemometers.

Army White Sands Signal Agency, White Sands [Missile Range] N. Mex.
LABORATORY INVESTIGATION OF DOVAP TRANSPONDER T7-3-8 MISSILE UNIT (36.94 - 73.88 MCS), by Merwin A. Olson and Harvey G. Lassiter. 29 July 57, 31p. AFC rept. no. DOVAP-29-7-57-RT; AD-149 067.
Order from LC mi$3.00, ph$6.30 PB 138 629

Results are presented of a laboratory investigation of a Dovap transponder T7-3-8 missile unit. Special attention is given to the interference to the Dovap system from operations on 36.5 mc. The T7-3-8 is contained in a cylindrical metal case 3 1/4 in. in diameter and 12 1/4 in. long. It operates from a 6-v dc self-contained or external supply. Signals on 36.94 mc are received by the unit and amplified in 2 stages, then fed to a doubler stage which doubles the frequency to 73.88 mc. A driver and an output stage completes the line-up. The power output of about 0.7 w is realized from the unit for input signal levels of -60 dbm or higher. The ground equipment in the system compares the frequency of the signal received from the transponder with the double of the frequency sent to the unit; any difference is due to the Doppler effect and can be used to calculate the component of velocity normal to the ground station. Results indicate that if the interference signal could be reduced sufficiently before the signals reach a nonlinear circuit (where mixing action could occur), this effect might be eliminated. The recommendations suggest operation of the first 2 stages as near linear as possible with the current high enough to prevent nonlinear operation caused by limiting action. Possibly more tuned circuits should be employed in the first stages to reduce the interference signals as much as possible before they reach the double stage.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
CHRONOGRAPH ERROR IN DRAG MEASUREMENTS, by G. D. Kahl and F. D. Bennett. Aug 58, 13p. 2 refs. Memo. rept. no. 1161.
Order from LC mi$2.40, ph$3.30 PB 138 616

The precision of the least squares method of fitting time-distance data from an observed trajectory is considered for the case where time is assumed to be a polynomial in distance. A relation between the variances of time and distance errors, assumed in a previous work, is derived. With this relation and a model of digital chronographs, the variance of the timing error is found for selected chronograph arrangements; in a favorable arrangement, this variance is only one-twelfth as large as the squared counter resolving time. A comparison of time and distance errors is made.

Cryogenic Engineering Lab., National Bureau of Standards, Boulder, Colo.
CRYOGENIC MATERIALS DATA HANDBOOK. Quarterly rept. no. 1 on Contract AF 04(647)59-3. [Jan 60] 22p.
Order from OTS $0.75 PB 161 093

This handbook of data on solid materials at low temperatures deals with physical properties of certain metals and non-metals over the temperature range minus 423°F to plus 500°F. The materials selected for inclusion in the handbook are limited to aluminum, cobalt, copper, iron, nickel, titanium, carbides, nonmetals, and miscellaneous metals and alloys. The materials are mostly those in current use for missile applications at cryogenic temperatures, but a few

have been included because of their potential for such uses. This compilation of some of the mechanical properties of materials should assist the designer by making available in one publication reliable data which have appeared in the literature or which have not yet been published.

Defense Research Lab., U. of Texas, Austin.
A CRITIQUE OF ACOUSTIC MINE DETECTION METHODS, by Joseph F. Mifsud. Rept. on Contract DA 44-009-eng-2073. 27 Oct 55, declassified 13 Mar 58, 24p. 12 refs. DRL-A-95.
Order from LC mi$2.70, ph$4.80 PB 143 729

The purpose of this paper is to summarize the work accomplished in acoustic mine detection and to suggest some of the areas of research that need yet to be explored in order that a more efficient acoustic detector of land mines can be designed.

Defense Research Lab., U. of Texas, Austin.
A SUMMARY OF THE MINUTES OF THE PANEL ON ACOUSTIC DETECTION OF BURIED LAND MINES [MEETING NO. 1] 27-28 OCTOBER 1955, AUSTIN, TEXAS. Rept. on Contract DA 44-009-eng-2073. 21 Dec 55, declassified 3 Mar 58, 22p. DRL Acoustic rept. no. 98.
Order from LC mi$2.70, ph$4.80 PB 143 728

Defense Research Lab., U. of Texas, Austin.
A SUMMARY OF THE MINUTES OF THE PANEL ON ACOUSTIC DETECTION OF BURIED LAND MINES [MEETING NO. 2] 29 APRIL 1956, WASHINGTON, D. C. Rept. on Contract DA 44-009-eng-2073. 11 July 56, declassified 12 Mar 58, 18p. DRL Acoustical rept. no. 107.
Order from LC mi$2.40, ph$3.30 PB 143 727

See also PB 143 728

Defense Research Lab., U. of Texas, Austin.
A SUMMARY OF THE MINUTES OF THE PANEL ON ACOUSTIC DETECTION OF BURIED LAND MINES [MEETING NO. 3] 15 JULY 57, MONTEREY, CALIF. Rept. on Contract DA 44-009-eng-2875. 18 Sep 57, declassified 14 Mar 58, 35p. 3 refs. DRL-Acoustical rept. no. 127.
Order from LC mi$3.00, ph$6.30 PB 143 725

See also PB 143 727

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
ANALYSIS OF HMX/RDX MIXTURES BY ISOTOPE DILUTION AND SPECTROPHOTOMETRIC PROCEDURES, by Frederick S. Holahan, Ruth N. Shelley and others. July 59, 15p. 15 refs. Technical rept. 2625; AD-215 863.
Order from LC mi$2.40, ph$3.30 PB 143 286

This report describes two methods for the quantitative assay of HMX in mixtures of HMX and RDX: (a) an extension of the Holston Ordnance Works' method (which is based on a colorimetric reaction specific for RDX and a determination of HMX content by difference) by which mixtures containing more than 95% HMX can be analyzed; and (b) an isotope dilution technique in which a known amount of pure carbon-14 labeled HMX is added to the mixture and the radioactivity of a fraction of pure HMX isolated from the mixture is determined. The HMX content is calculated from the reduction, or dilution, of the radioactivity of the isolated HMX. The method is considered absolute since the HMX is determined directly and there is no interference from impurities.

[Feltman Research and Engineering Labs.] Picatinny Arsenal, Dover, N. J.
AN EMISSION SPECTROGRAPHIC METHOD FOR THE ANALYSIS OF ZINC-BASE DIE CASTINGS, by Seymour Lader. June 58, 18p. 11 refs. Technical rept. 2528.
Order from OTS $0.75 PB 151 175

An accurate spectrographic method of analysis has been developed for the determination of the following elements in zinc-base die castings: aluminum 0.4-4.3%, copper 0.04-1.30%, cadmium 0.002-0.01%, magnesium 0.015-0.08%, tin 0.002-0.01%, lead 0.002-0.01%, iron 0.015-0.10%. These specified ranges are appropriate for the analysis of zinc-base die castings meeting the requirements of Specification QQ-Z-363, Compositions A and B.

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
INVESTIGATION OF THE MAXIMUM ALLOWABLE TORQUE FOR ROTARY SELECTOR KNOBS, by Peter F. Worms and C. Thomas Goldsmith. Nov 58, 15p. 3 refs. Technical rept. 2551; AD-201 105.
Order from LC mi$2.40, ph$3.30 PB 138 638

When rotary selector knobs are used on missiles, their setting may be altered by in-flight vibrations. The probability of a setting being changed is reduced as torque on the selector shaft is increased. It was the purpose of this study to determine the maximum torque which can be used with varying sized knobs. A previously recommended resistance for rotary selector knobs was 48 ounces. This study evaluated resistances well above this figure.

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
PREPARATION AND PHYSICAL PROPERTIES OF DI-AND TRINITROTOLUENE ISOMERS, by Cornelius Conklin and Frank Pristera. July 58, 26p. Technical rept. 2525.
Order from LC mi$2.70, ph$4.80 PB 138 925

This report includes detailed methods for the preparation of all commercially unavailable isomers of DNT and TNT. In addition it includes the melting points, infrared spectrograms, X-ray diffraction data, and some solubility data on the TNT and DNT isomers.

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
PROPOSED SHELL LOADING STANDARDS BASED ON A STATISTICAL STUDY OF SETBACK SENSITIVITIES, by Samuel D. Stein and Martin J. Margolin. Nov 58, 61p. 16 refs. Technical rept. 2563; AD-202 576.
Order from LC mi$3.90, ph$10.80 PB 138 637

A statistically designed test program was conducted using a laboratory-scale device which simulates the setback pressures developed when shell are fired from guns. The following conditions increase the probability of premature initiation when HE-loaded shell are fired under the present normal setback pressures: (1) Grit at the interface of the explosive charge and the base of the shell; (2) A separation of more than 1/16 inch between the explosive and the base of the shell; (3) A cavity at the base of the explosive charge; and (4) A gouge on the interior surface of the base of the shell. On the basis of these and other results, it was possible to propose relaxed and simplified requirements as revisions to Specification MIL-L-20336A. In general, the relaxed cavitation requirements should vastly facilitate the mass production loading of high explosive shell.

Flight Control Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
SOME FLIGHT CONTROL PROBLEMS OF A CIRCUMNAVIGATING LUNAR VEHICLE, by George Xenakis. Mar 58, 34p. 12 refs. WADC Technical note 58-82; AD-151 111.
Order from LC mi$3.00, ph$6.30 PB 138 851

Some problems of flight control for a vehicle required to pass around the moon and return to a braking ellipse in the earth's atmosphere are investigated. It is shown that reliability will be an extreme problem for this mission. The need for velocity vector control for the mission is established and a method for accomplishing it is presented. In addition, velocity vector tolerances for successful recapture are investigated along with some brief considerations of landing at a preselected earth site and of flight in non-terrestrial atmospheres.

Naval Ordnance Lab., White Oak, Md.
EFFECTS OF ELEVATED TEMPERATURES ON ELECTRICAL INITIATORS AND COMPONENT PARTS, by H. S. Leopold. 1 Apr 59, 69p. 4 refs. NAVORD rept. 6267.
Order from LC mi$3.90, ph$10.80 PB 143 335

A study has been made of the effects of elevated temperatures on the XE-16A Actuator, XE-54B Primer, XE-57A Primer, XE-69A Primer, Mk 115 Mod O Primer, and the Mk 121 Mod O Primer, and on their inert component parts. It has been found that graphite bridges and bridges attached to bakelite initiator plugs by the spray metal method have poor thermal resistance. Ceramic initiator plugs with the bridge wire swaged into welded nickel tabs, and glass kovar initiator plugs with the bridge wire soldered with lead (m.p. 621°F) have good thermal resistance.

Naval Ordnance Test Station, China Lake, Calif.
AXIAL DECELERATION AT OBLIQUE WATER ENTRY OF 2-INCH-DIAMETER MODELS WITH HEMISPHERE AND DISK-CYLINDER NOSES, by G. G. Mosteller. 12 Feb 57, 48p. 7 refs. NOTS-1687; NAVORD rept. 5424; AD-140 642.
Order from LC mi$3.30, ph$7.80 PB 143 256

Axial deceleration-time records have been made in the NOTS Variable-Angle Variable-Pressure Launching Tank at trajectory angles of 15, 30, 45, 60, and 75 degrees for hemisphere and disk-cylinder noses, at 90 degrees for the hemisphere nose, and at entry velocities of 25, 50, and 75 fps. Methods for using these data for the prediction of axial acceleration-time function of other missiles are given. These records are compared with theory and results of other experiments.

Naval Propellant Plant, Indian Head, Md.
A RAMP-TYPE TESTING CIRCUIT FOR ELECTRIC EXPLOSIVE DEVICES, by A. H. Klein and T. D. Phillips. 3 Nov 58, 18p. Memo. rept. no. 155.
Order from LC mi$2.40, ph$3.30 PB 139 157

A circuit has been designed for the determination of the relative sensitivity to electrical initiation of a squib or ignition element in comparison to similar squibs or ignition elements. In this circuit, the squib or other electric explosive device is fired by sending through its bridge wire a current which increases with time along an established curve. The position on the current-time curve at which firing occurs is the datum observed. The circuit is particularly useful in experimental work in which the items to be tested cannot be produced in sufficient quantity to supply a test of the "fire-or-fail" type.

Picatinny Arsenal, Dover, N. J.
METHOD OF CALCULATION OF INTERIOR BALLISTIC PROPERTIES OF PROPELLANTS FROM CLOSED BOMB DATA, by Arnold O. Pallingston and Murray Weinstein. June 54, 52p. 10 refs. Technical rept. 2005.
Order from LC mi$3.60, ph$9.30 PB 139 185

This report covers the methods of calculation of relative force, relative quickness and linear burning rate for artillery propellants. It describes devices which have been developed to simplify and make more accurate the information which can be obtained from oscillograms of closed bomb tests giving dP/dt vs P. It gives the methods by which linear burning rates of propellants are derived. The methods described are essentially for use with experimental propellants and are not intended for production or quality control.

Picatinny Arsenal, Dover, N. J.
UTILIZATION OF BY-PRODUCT ISO-TRIOIL RESULTING FROM NITRIC ACID PURIFICATION OF CRUDE TNT, by J. A. Cussen. Jan 59, 9p. Technical rept. DB-TR:15-58.
Order from LC mi$1.80, ph$1.80 PB 139 082

This report covers studies conducted relative to establishment of Ordnance uses for Iso-Trioil, a by-product resulting from the purification of crude TNT by recrystallization from nitric acid.

Pitman-Dunn Labs. Group, Frankford Arsenal, Philadelphia, Pa.
DEVELOPMENT OF DISINTEGRATING WATER PROJECTILES FOR RECOILLESS RIFLES, by A. Levine. June 58, 23p. 6 refs. Memo. rept. MR-675.
Order from LC mi$2.70, ph$4.80 PB 139 080

Disintegrating water projectiles, consisting of water-filled cylindrical cardboard containers, were developed to simulate the interior ballistics produced in recoilless rifles by firing standard projectiles.

Pitman-Dunn Labs. Group, Frankford Arsenal, Philadelphia, Pa.
SEALING STUDIES ON CARTRIDGE ACTUATED DEVICES, by J. F. Clark. Sep 58, 33p. Rept. no. R-1469.
Order from LC mi$3.00, ph$6.30 PB 138 726

Investigations were conducted using quad rings, O-rings, silicone rubber washers, and Teflon rings as sealing media. Each of these products was found to be effective in specific applications; however, the O-ring was particularly adaptable to existing cartridge actuated devices and was used almost exclusively in the modifications made under this program.

Pitman-Dunn Labs. Group, Frankford Arsenal, Philadelphia, Pa.
SIMPLIFIED EXTERIOR BALLISTIC EQUATIONS, by R. R. Rhodes. May 58, 13p. Memo. rept. MR-672.
Order from LC mi$2.40, ph$3.30 PB 139 146

The principal problem in accuracy firings is the determination of the angle of elevation necessary to hit the target at a given range, with a given projectile, launched at a given velocity. A simple method for calculating this parameter for angles less than five degrees and other data useful in test firing are presented. The formulae developed are tabulated in the appendix and a nomogram was contructed to permit their graphic solution. By these means, the probability of first round hit for any accuracy study is greatly increased.

Radio Corp. of America, Moorestown, N. J.
MINSTREL: A STUDY OF THE OPTIMUM SYSTEM FOR MISSILE INSTRUMENTATION BY ELECTRONIC MEANS, by N. N. Alperin, K. E. Andrews and others. Task rept. no. 1 on Contract DA 36-039-sc-74853. 24 Jan 58, 103p. 26 refs. AD-155 240.
Order from LC mi$5.70, ph$16.80 PB 143 305

This report discusses various coordinate systems which can be applied to the data acquisition and range safety problems at White Sands Proving Grounds. The distortions and assumptions that characterize each are also discussed. For safety purposes, the data output and displays must be on a real time basis. The Transverse Mercator map presently in use at the White Sands Proving Ground is satisfactory for the present range. However, for a 1500-mile range, the problems of display warrent the use of a different system. Stereographic projection is recommended for the following reasons: (1) It is conformal, (2) Its distortion is low, (3) The angle between two lines on earth are carried to the plane of the map as an equal angle, (4) It requires little scale factoring. The coordinate conversions required for the two systems above are presented.

Rock Island Arsenal Lab., Ill.
CHARACTERISTICS OF VIC MATERIALS WHEN APPLIED AS PACKAGING MEDIA, by F. H. Wayne. 18 Feb 59, 15p. Rept. no. 59-464; AD-216 699.
Order from LC mi$2.40, ph$3.30 PB 143 440

This report covers results observed during the examination of Cal. .30 M1 carbines. These weapons had been in unheated warehouse storage for four years, plus a two year period in open exposure (tarpaulin covered). These carbines were packaged with four different types of volatile corrosion inhibitors used as the preservative medium. The four different types of inhibitors furnished adequate protection to the carbines and component parts during the exposure period. There was no visible evidence of rust on any of the metallic surfaces of the carbines, slings, magazines or the oilers. The gummy substance did not cause any damage to the wood stock.

Rock Island Arsenal Lab., Ill.
TEFLON PACKINGS WITHOUT CUP RINGS FOR 105 MM HOWITZER RECOIL MECHANISMS, by L. R. Raisbeck. 11 May 59, 25p. 2 refs. Rept. no. 59-1270; AD-215 627.
Order from LC mi$2.70, ph$4.80 PB 143 427

Four types of experimental Teflon packings without supporting cup rings were evaluated on the basis of their efficiency in transmitting axial load supplied by the Belleville springs to radial pressure against the cylinder walls. Evaluations were made with packings for the 105 MM Howitzer Recoil Mechanism Floating Piston at sub-zero, normal and elevated temperatures using a conventional floating piston and a special radial pressure transducer. Results of tests indicated that the axial loads were not as efficiently transmitted to radial pressure at sub-zero temperatures as at normal and elevated temperatures by any of the packings. Results also showed that a hysteresis loop existed in the radial pressure curves of all packings. The radial pressures obtained when decreasing the axial loads were greater than when increasing the axial loads. The best axial load vs. radial pressure characteristics at all temperatures were obtained with a packing which had a shroud consisting of three wedge shaped Teflon rings.

Stanford Research Inst., Menlo Park, Calif.
DEVELOPMENT OF PROCEDURES AND TECHNIQUES FOR PREPARING BONDED DOUBLE LAYER TANTALUM-COPPER COMPOSITE PLATES, by R. C. Bertossa and S. Rau. Rept. on Atlas Materials, Contract AF 33(616) 5215. Nov 58, 114p. 5 refs. WADC Technical rept. 58-396; AD-203 901.
Order from LC mi$6.00, ph$18.30 PB 143 623

A process for bonding tantalum sheet to OFHC copper was successfully accomplished both by casting molten copper directly into an annealed tantalum cone under controlled vacuum-inert gas atmospheres, and by using intermediate brazing alloys to produce high integrity,

vacuum bonded joints between OFHC copper and annealed tantalum. Metallurgical and microhardness evaluations reveal that sound, continuous bonds can be effected, with ductile interfaces. Elevated temperature tests on copper-tantalum clad nose-cones exhibited the ability of selected brazing alloys to maintain intimate contact between the copper and tantalum at temperatures up to the melting point of copper.

Stanford Research Inst., Menlo Park, Calif.
A NEW COORDINATE SYSTEM FOR SATELLITE ORBIT STUDY, by J. L. Brenner, G. E. Latta and M. Weisfeld. Interim technical rept. no. 2 on Contract AF 29(600)1773. 15 June 59, 90p. 5 refs. AFMDC-TR-59-27; AD-216 455.
Order from LC mi$4.80, ph$13.80 PB 143 517

This report gives an accurate prediction of the orbit of a near-earth satellite, neglecting drag. A special coordinate system suggested by D. G. King-Hele has been so refined that the predictions can be made to within a few seconds of arc at all points in the orbit of a typical satellite, with apogee and perigee distances of (say) 400 and 3000 statute miles respectively. King-Hele and other authors have proposed similar but somewhat less exact equations; further, the validity of these equations ($e \leq 0.05$) was restricted to small eccentricities. No such restriction is made in the present theory. Formulas in this report give Ω, I, $U = 1/L$r, M as functions of the time t. A completely rigorous proof of the accuracy of these formulas is available only in special cases. The order of approximation of the formulas is discussed by the use of arguments based on the energy integral. Their accuracy has been verified also by independent numerical integration of the differential equations.

Sanitation and Safety Engineering

Aeronautical Accessories Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
FACTORS INVOLVED IN DETERMINING THE EFFICIENCY OF FIRE EXTINGUISHING AGENTS, by Ralph L. Hough. Apr 59, 75p. 6 refs. WADC Technical note 58-281; AD-203 398.
Order from LC mi$4.50, ph$12.30 PB 143 541

Results of the agent concentrationstudies indicate that currently available agents may act as "super agents" through more efficient application. "Critical saturation values" are proposed for the agents, bromochloromethane (CB) and bromotrifluoromethane (BT or Freon 13B1). These values represent minimum volumetric concentrations necessary when extinguishing 100 octane aviation fuel diffusion flames and when utilizing the agent at 100 per cent efficiency. An efficiency equation is proposed for use with the "critical saturation value." A test procedure is outlined for applying the equation to a particular system. The equation may be used as a tool in evaluating extinguishing systems.

Bureau of Yards and Docks, Washington, D. C.
REFUSE DISPOSAL. 1 Sep 52, 30p. 5 refs. Technical pub. NAVDOCKS TP-Pu-1.
Order from OTS $0.75 PB 161 054

The purpose of this publication is to provide detailed information to serve as a guide in organizing an efficient collection, segregation, and disposal system at a naval establishment. The procedures described herein are applicable to all solid forms of waste resulting from human activities, except the following specialized forms of waste: dehydrated sewage sludge, industrial process wastes such as oil sludge and sandblast refuse, excavated earth, wreckage from buildings, and discarded explosives. Suggested methods for disposing of some types of oil sludge are given. The disposal of sandblast refuse resulting from the docking of ships, and other specialized wastes, is to be covered in other publications.

Naval Research Lab., Washington, D. C.
VISIBILITY AND SUGGESTED MILITARY USES AT NIGHT OF SELF-LUMINOUS MARKERS EXCITED BY STRONTIUM-90, by G. T. Hicks, C. M. Whitfield, Jr. and L. H. Dawson. 23 June 53, declassified 15 Dec 53. 14p. 2 refs. NRL rept. 4192.
Order from LC mi$2.40, ph$3.30 PB 143 866

Self-luminous markers excited by the radioisotopes strontium-90 are available to the armed services. Visibility tests have been made on these markers at night under different sky conditions. It was found that the maximum visible distance increased in direct proportion to an increase in marker radius for a given brightness. It was found that on a clear moonless night, a radioactive green marker 1-3/4 inches in diameter with brightness greater than 60 effective microlamberts could be seen approximately 1000 feet when viewed extrafoveally.

New York U. Coll. of Engineering, N. Y.
THE ENGINEERING BIOTECHNOLOGY OF HANDLING WASTES RESULTING FROM A CLOSED ECOLOGICAL SYSTEM, by William T. Ingram. Rept. on Contract AF 18(603)71. Feb 58, 221p. 174 refs. AFOSR-TR-58-148; AD-162 277.
Order from LC mi$9.90, ph$34.80 PB 143 122

This report is directed to an examination of the status of existing information and the areas of research requiring attention in connection with the handling of wastes resulting from human occupancy of a closed ecological system. Probable wastes to be handled are classified. The problems related to handling and treatment and to cycling and reuse of treated end products in liquid, solid, and gaseous form are discussed. Five detailed reports discussing the present status of knowledge of wastes handling in closed systems are included as appendices. Areas of research and development are suggested with respect to skin excretions, algae, culture, carbon dioxide conversion to oxygen, the handling of closed space air, and the handling of bodily and other wastes. A master file of 174 annotated references and an alphabetical author index to those references are included.

FOOD, HANDLING, AND PACKAGING EQUIPMENT

Food

Pennsylvania State U., University Park.
ODOR AND FLAVOR PROBLEMS IN RADIATION STERILIZATION OF FOODS, by D. V. Josephson. Rept. no. 9 (Final) for 3 May 55-3 Dec 56 on Contract DA 19-129-qm-375. [1956] 32p. 12 refs. File no. S-534; AD-122 143.
Order from LC mi$3.00, ph$6.30 PB 143 781

The following are considered to be major accomplishments of the investigation: (1) Methodology was developed which should be useful in application to any flavor identification problem. This consisted of a distillation technique to collect volatiles, gas chromatography to fractionate the volatiles and mass spectrometry to identify the individual compounds. (2) It was shown that a group of disagreeable smelling sulfur compounds are responsible for the radiation induced off-flavor and odor in skim milk and sodium caseinate sols. (3) Two off-flavor preventive mechanisms of interest were noted. (a) Radiated skim milk exhibited considerably less off-flavor and off-odor than did radiated milk protein preparations. This difference was found to be due in substantial part to the presence of lactose. The possibility that lactose, a relatively unsweet carbohydrate, may be used as an additive to foods to prevent radiation induced off-flavors seems worthy of consideration. (b) According to evaluations by the taste panel, skim milks which were preheated to 180° F. for 10 minutes had more acceptable flavor than skim milks which had only been pasteurized or which had received no preheating treatment at all prior to radiation. These observations suggest the feasibility of combining heat treatment and radiation in the preservation of milk.

United States Testing Co., Inc., Hoboken, N. J.
MEAT ANALYSIS, by Dean Foster. Rept. no. 8 (Final) for 25 Apr 55-24 Apr 57 on Contract DA 19-129-qm-346. [1957] 12p. QFCIAF File no. A-319.
Order from LC mi$2.40, ph$3.30 PB 143 666

An attempt was made to determine how and to what extent it is possible to differentiate between comparable canned and fresh foods.

Packaging

Forest Products Lab., Madison, Wis.
PRESERVATION OF THE EXTERIOR SURFACES OF WOODEN SHIPPING CONTAINERS TO RETAIN IDENTIFICATION SYMBOLS IN LONG-TERM OUTDOOR STORAGE: FOURTH PROGRESS REPORT ON FIELD TESTS, by V. P. Miniutti, E. A. Mraz, and D. F. Laughnan. 17 June 58, 31p. 5 refs. Rept. no. 58-1.
Order from LC mi$3.00, ph$6.30 PB 143 057

This report summarized the procedures used in preparing, stenciling, and placing wood shipping containers in outdoor storage at Madison, Wis.; Panama Canal Zone; Fort Churchill, Canada; and Yuma, Ariz., and gives the results of inspections of steel bindings and stencils on the boxes after 3 years of outdoor storage.

Forest Products Lab., Madison, Wis.
PRESERVATION OF THE EXTERIOR SURFACES OF WOODEN SHIPPING CONTAINERS TO RETAIN IDENTIFICATION SYMBOLS IN LONG-TERM OUTDOOR STORAGE: FIFTH PROGRESS REPORT ON FIELD TESTS, by V. P. Miniutti, E. A. Mraz and D. F. Laughnan. 2 June 59, 33p. 6 refs. Rept. no. 59-1.
Order from LC mi$3.00, ph$6.30 PB 143 062

Wood shipping containers were stenciled, bound with steel bindings, and placed in outdoor exposure at Madison, Wis., Panama Canal Zone, Fort Churchill, Canada, and Yuma, Ariz. Four marking materials were used with seven combinations of two undercoat and four topcoat treatments on boxes made of red oak, Douglas-fir, and southern yellow pine. The best legibility after 4 years of exposure was found on the backs (north exposure) of the test boxes for 9 of the 12 combinations of species and sites, and on the fronts (south exposure) for the other 3 combinations. For boxes pretreated with material A, a water-repellent preservative, there was no combination of side, species, and site for which all stencils made with 12 combinations of marking material and undercoat-topcoat treatment were legible after 4 years of exposure. Stencils made with four of these combinations were legible after 4 years of exposure on the backs of the boxes of all three species from all of the test sites. A comparison of the southern yellow pine boxes with and without pretreatment with material A indicated that material A had a detrimental effect on the performance of the stencils at three of the sites.

MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT

Franklin Inst. Labs. for Research and Development, Philadelphia, Pa.
A STUDY OF THE STABILITY OF EXTERNALLY PRESSURIZED GAS BEARINGS, by Lazar Licht and Harold Elrod. Interim rept. on Contract Nonr-2342(00), Nov 58, 48p. 6 refs. I-A2049-4.
Order from LC mi$3.30, ph$7.80 PB 143 477

The subject of this paper is the stability of externally pressurized gas bearings. The pertinent equations are linearized and the stability criteria stated in considering small deviations from the equilibrium point. The flow in the bearing clearance is treated on a distributed rather than on a lumped parameter basis. Results thus obtained, when compared with those previously arrived

at by means of a simplified analysis, show a marked divergence in the limiting values of parameters which influence the stability of the bearing. Differences in predictions of the simplified and present analyses with regard to the permissible compression volume in the bearing interspace and the effect of varying the mass of the bearing are emphasized and discussed.

Engines and Propulsion Systems

Ballistic Research Lab., Aberdeen Proving Ground, Md.
EXPERIMENTAL STUDY OF COMBUSTION INSTABILITY IN SOLID ROCKET PROPELLANTS: PART I, by Leland Watermeier, Trexler Satkowski, and Thomas Mifflin. Oct 58, 65p. 2 refs. Memo. rept. no. 1172; AD-206 469.
Order from LC mi$3.90, ph$10.80 PB 143 263

Slabs of double-base and composite rocket propellants were burned in a transparent-walled vessel which was vented to the atmosphere. The propellants were ignited at ambient pressures of 200-300 psi with the chamber pressure reaching approximately 350-475 psi during the burning process. A new method was developed for the determination of burning rates of solid propellants. The apparatus and procedure used in the investigation are presented together with selected photographs of the burning propellant surfaces.

Battelle Memorial Inst., Columbus, Ohio.
RESEARCH STUDIES ON THE COOLING AND CLEANING OF EXHAUST GASES CONTAINING BORON COMBUSTION PRODUCTS, by G. M. Hein, A. R. Orban, and R. B. Engdahl. Final technical rept. on Contract AF 40(600)711. July 58, 71p. 11 refs. AEDC-TR-58-9; AD-161 031.
Order from LC mi$4.50, ph$12.30 PB 138 609

All possible methods which might be practicable for the removal of boron oxide particles from high-temperature exhaust gases have been considered in this project. A literature survey led to the conclusion that wet scrubbers would be most adaptable for this application.

Hiller Aircraft Corp., Palo Alto, Calif.
A DESIGN STUDY OF HELICOPTERS POWERED BY ROTOR TIP MOUNTED TURBOJET ENGINES, by C. W. Messinger, W. Gevarter and others. Summary rept. on Contract Nonr-1814(00). Oct 58, 148p. 28 refs. Rept. no. 58-139.
Order from LC mi$7.20, ph$22.80 PB 143 247

A design study of tip-turbojet powered helicopters of several gross weights to demonstrate practicality of the concept and to establish performance capabilities for comparison with helicopters using other methods of propulsion.

Jet Propulsion Center, Purdue U., Lafayette, Ind.
AN EXPERIMENTAL AND THEORETICAL INVESTIGATION OF FILM COOLING IN ROCKET MOTORS, by A. R. Graham. Final rept. on Contract N7onr-394(18). Oct 57, 274p. 34 refs. Rept. no. F 57-3; AD-200 878.
Order from LC mi$11.10, ph$42.60 PB 138 745

Experiments on film cooling were conducted with a rocket motor burning WFNA (white fuming nitric acid) and JP-4 (jet engine fuel) at a combustion pressure of 500 psia and at a thrust level of 500 pounds. The flow rates of film coolant required for film cooling different length cylindrical sections with WFNA and JP-4 were determined, and those results were compared to the experimental results previously obtained by Sellers (9) for the case of film cooling with water. An analytical method for calculating the required film coolant flow rate for cooling a given length cylindrical section was devised.

Propulsion Research Corp., Santa Monica, Calif.
ESCHER WYSS CLOSED CYCLE AIRCRAFT POWERPLANT STUDY. PART II, by Rolf D. Buhler. Interim summary rpt. on Study of the Military Applications Potential of Closed Cycle Gas Turbines, Contract AF 18(603)27. 10 May 57, 48p. 5 refs. Rept. no. R-259; AFOSR TR-57-37; AD-126 570.
Order from LC mi$3.30, ph$7.80 PB 129 887

A portion of a study on closed cycle gas turbines for aircraft has been summarized and evaluated. This study dealt with closed cycle turbine - ducted fan powerplants suitable for a gas-cooled reactor heat source. The reactor - gas turbine loop would use helium, at a turbine inlet condition of about 70 atm and 1800°F. Cycle calculations with and without a regenerator show a potential heat consumption at sea level static conditions of 7.5 - 12.2 x 10^3 Btu/hr-lb thrust (equivalent to an sfc of .42 - .68 for hydrocarbon fuels), and an air specific impulse of about 30 (#-sec/lb) with a 1.6:1 pressure ratio fan. The regenerator would be extremely compact, about 1.6 cu. ft/hp, the cooler rather bulky, about 30 cu. ft/hp, but not excessively heavy. The cooler and regenerator together would weigh about .13 lb/hp. The closed cycle turbomachinery would be extremely small, favoring the design of large power units (above 15,000 hp).

Propulsion Research Corp., Santa Monica, Calif.
EXPERIMENTAL INVESTIGATION OF A THREE DIMENSIONAL ALL SUPERSONIC DIFFUSING CASCADE, by T. Iura and E. Beder. Rept. on Contract AF 18(600)1143. May 58, 185p. 18 refs. Rept. no. R-288; AFOSR TR-58-132; AD-203 712.
Order from LC mi$8.40, ph$28.80 PB 142 912

A three-dimensional all-supersonic diffusing cascade was designed by the stream surface characteristics method and tested in a wind tunnel over the Mach number range 2.2 to 3.0. Stable supersonic flow was established over a wide range of incidence angles. Chordwise blade-surface static pressures, exit-plane pitot surveys, and Schlieren photographs were obtained.

Manufacturing Equipment and Processes

American Car and Foundry Co., New York.
WELDABILITY OF RARE-EARTH-TREATED HOMOGENEOUS ARMOR STEEL PLATE, by George Reed. Rept. on Contract DA 36-034-ORD-1423. 31 July 57, 31p. Major rept. no. 207B; WAL-642/218-2.
Order from LC mi$3.00, ph$6.30 PB 139 164

The rare-earth-oxide-treated heat had the best weldability and the production armor heat the poorest. The rare-earth-oxide-treated heat also possessed the lowest hardenability, and better inherent weldability. It was indicated, that the rare-earth-metal addition significantly reduced the sulfur content of the steel and improved the impact resistance. The rare-earth-oxide addition, appeared to have no significant effects on either sulfur content or impact resistance.

Army Chemical Corps Engineering Command, Army Chemical Center, Md.
ANNUAL STANDARIZATION SYMPOSIUM NO. 2, 18-19 MAY 59, by Kenneth P. Moseley. 12 June 59, 94p.
Order from LC mi$5.40, ph$15.30 PB 143 288

Chemical Corps Progress, Standardization and Small Business, Effect of Department of Defense Standardization on Research and Development, Standardization - A Vital Link to Government-Industry Cooperation, Engineering Standardization - The Bridge Between Research and Development in Production, Engineering Standards, The Standards Engineers Society (SES) and the Defense Standardization Program, The Importance of Standard Testing Methods as They Relate to Military Standards, the ASTM and Industrial Chemicals, Product Acceptance and Inspection, Legal Aspects of Standardization, Conservation of Manpower and Materials, Department of Defense Standardization, Panel Discussions.

Titanium Metals Corp. of America [Henderson, Nev].
TITANIUM SHEET ROLLING PROGRAM FOR Ti-6Al-4V AND Ti-4Al-3Mo-1V. FINAL REPORT, PART I: Ti-4Al-3Mo-1V. Final rept. on Contract NOas-56-993-C. 15 May 59, 119p.
Order from LC mi$6.00, ph$13.30 PB 143 770

Development and production of Ti-4Al-3Mo-1V sheet under the Department of Defense Titanium Sheet Rolling Program. Development of manufacturing methods and selection of a sponge hardness level for the alloy and production of heat treated aircraft quality sheet for evaluation by various aircraft companies. Essentially all sheets developed strengths above the original target of 147,000 psi minimum yield strength after solution treating and aging. Ductility in the solution treated and aged condition varied with the gage.

Titanium Metals Corp. of America [Henderson, Nev.]
TITANIUM SHEET ROLLING PROGRAM FOR Ti-6Al-4V AND Ti-4Al-3Mo-1V. Final rept., Pt. 2, on Ti-6Al-4V, Contract NOas-56-993-C. 1 July 59, 53p.
Order from LC mi$3.60, ph$9.30 PB 143 628

Annealed Ti-6Al-4V sheet in various aircraft gages on a commercial basis. Information on production procedures, chemical uniformity, and mechanical properties of the sheets produced are presented. Sheets were also solution treated on the resistance heating, spray quench apparatus to demonstrate heat treat capability.

Westinghouse Research Labs., Pittsburgh, Pa.
JOINING OF MOLYBDENUM, by William N. Platte. Rept. for 15 Feb 56-14 Apr 57 on CFPS Materials, Contract AF 33(616)3524. Aug 57, 165p. 38 refs. WADC Technical rept. 57-309; AD-149 847.
Order from LC mi$7.80, ph$25.80 PB 143 644

Available metallurgical data on molybdenum base alloys indicated that additions of aluminum, titanium, carbon, and zirconium should provide good welding properties. Aluminum additions in the range of 0.18 to 0.22% gave welds that could be deflected 120° at room temperature. Welds in 0.5% Ti with 0.05% C produced the best results. Carbon in molybdenum-carbon alloys was shown to improve the weld metal ductility by reducing the oxygen content of the base material and by a protective deoxidization action during welding. Moldbdenum with 0.06% carbon showed the best bend ductility within the carbon range examined. Post-welding residual stresses could be eliminated by a vacuum heat treatment at 1832°F.

Transport, Traction and Hoist Facilities

Detroit Arsenal, Center Line, Mich.
TEST OF THE DUAL PURPOSE HEATER KIT INSTALLED ON THE MORTAR CARRIER, M84, AT LOW AMBIENT TEMPERATURES, by Simon J. Grabowski. 10 Nov 58, 42p. Rept. no. 4330 (Final).
Order from LC mi$3.30, ph$7.80 PB 139 144

To evaluate the effectiveness of a dual purpose heater kit on the Mortar Carrier, M84, tests at 0 F, minus 25 F, minus 45 F, and minus 65 F were conducted at the Detroit Arsenal. Excessive heating time of the power plant compartments was experienced during tests at low ambient temperatures. However, the personnel heating system achieved the minimum Continental Army Command temperature recommendations. A recommendation is made that the kit be modified to lower excessive heating time of the power plant compartments.

Mansfield Tire and Rubber Co., Ohio.
THE DESIGN, DEVELOPMENT, AND TESTING OF AN IMPROVED TYPE "COMBAT" TIRE. Final rept. for 4 June 54-30 June 57 on Contract DA 20-089-ORD-37142. [1957] 149p. 49 refs. AD-143 293.
Order from LC mi$7.20, ph$22.80 PB 138 660

An improved combat tire was constructed with regular 11.00-20 NDCC military tire molds, except for specially profiled mold base rings which allowed for maximum bead widths of 2 3/4 inches. A conventional type drum with a 1/4-in. rubber-and fabric-pad was used. A relatively large power drilling awl was used to vent the uncured tires. A specially designed new mold was made for curing the air bags. All materials used in the tires were standard natural-rubber compounds with regular nylon cord and cotton square woven fabrics, except for the tread stock which was the regular cold-rubber antiozonant compound. The double nylon-cord flippers were applied on the drum at the specified positions and stitched down to bead areas before the bead cables were applied. Each assembly unit was thoroughly stitched and awled to remove all possible air during the tire building. Two relatively wide breaker strips were applied as a band. The tires were shaped and bagged in conventional vacuum boxes with the inflated air bag capped to hold the pressure. The tires were cured on the tight side to avoid hot fracture after release of the internal pressure. The tires did not conform to the dimensions of regular military tires cured in the military NDCC molds. Endurance-wheel and limited road tests followed by plunger-energy tests were made on the same tire; results were satisfactory. Relatively dissatisfactory road tests for vehicle handling and tire action were run. Successful flotation, traction, and drawbar pull tests were made. Internal examination showed no major defects.

Massachusetts Inst. of Tech., Cambridge.
THE TRANSPORTATION PROBLEM WITH RANDOM DEMANDS, by James R. McCord, III. Master's thesis. Interim technical rept. no. 12 on Fundamental Investigations in Methods of Operations Research, Contract DA 19-020-ORD-2684. June 59, 100p. 3 refs. AD-216 900.
Order from LC mi$5.40, ph$15.30 PB 143 321

This report is an analytical exploration of the dependence of the classical transportation problem on variable and random parameters. Some well-known characteristics of the classical problem are first summarized. This facilitates the subsequent detailed investigation of the general 2 × n (two supplies and n demands) problem as a function of variable supplies, demands, and unit costs. The results are interpreted in terms of a two-dimensional geometrical visualization; in a certain sense, this type of picture may be viewed as a model of the class of all 2 × n problems. An interesting by-product of this analysis is a very simple method for solving classical 2 × n and m × 2 transportation problems. Some indications of possible generalizations to larger problems are also presented.

Coating and Chemical Lab., Aberdeen Proving Ground, Md.
LOW SURFACTANT CONTENT AMPHOTERIC CLEANERS, by A. Mankowich. 13 Aug 58, 13p. 3 refs. Rept. no. 62.
Order from OTS $0.50 PB 151 172

Low surfactant content alkaline cleaners have been developed suitable for use with missile component parts of magnesium, aluminum, zinc, etc. These compounds possess excellent detersive, heat stability and cleaning capacity characteristics and economy. They contain only 3.0 percent of a specific quaternary imidazolium hydroxide amphoteric surfactant plus 1.5 percent isooctylphenyl nonaethylene glycol ether (IOPNG). The amphoteric agent is the dicarboxylic analogue of the coconut oil derivative. Nonionics of the alkyl polyethylene glycol ether or alkyl polyethylene glycol thioether types may be substituted for IOPNG. The developed compounds permit a saving of about 16 percent over present-type Specification P-C-436a products.

Institute of Rubber Research, U. of Akron, Ohio.
STRESS RELAXATION AND STRUCTURE OF HIGH TEMPERATURE ELASTOMERS, by Maurice Morton, V. R. Allen, and R. D. Gates. Technical rept. no. 2, 1 Sep-31 Nov 58, on Contract Nonr-2573(00). [1958] 23p. 3 refs.
Order from LC mi$2.70, ph$4.80 PB 143 458

A further theoretical treatment has been applied to the relationship between sol formation and network degradation of elastomers, taking into consideration the possibility of "recombination" processes which may form new network chains. Some estimates have been made of the extent to which such a process may decrease the amount of sol obtained for a given degree of network degradation. The actual results obtained on the degradation of a swollen sulfur vulcanizate of natural rubber indicate that the main occurrence is actually a random chain scission, with some degree of "recombination" of the degraded chains. In other words, a crosslinking process appears to accompany the scission process. Natural rubber, vulcanized with sulfur to varying degrees, appears to show the sol-gel relation for crosslink scission, as would be expected. However, the situation is complicated to some extent by the probable occurrence of simultaneous random chain scission during vulcanization. (See also PB 140 880)

Ceramics and Refractories

Armour Research Foundation, Chicago, Ill.
THE MECHANICAL PROTECTION OF THE W/Ir THERMOCOUPLE, by Gary Steven and Walter C. Troy. 16 Jan 50, 10p. 4 refs. NEPA 1280-ARM-26; Rept. no. 25; AD-204 948.
Order from LC mi$1.80, ph$1.80 PB 138 317

Equipment was designed and constructed for use in subsequent tests. Beryllia tube protection of the W/Ir thermocouple was found to be unsatisfactory because of the porosity of the available crucibles. A literature survey on rhenium is appended.

Illinois U., Urbana.
FATIGUE AND INTERNAL STRESS ANALYSIS OF CERAMIC COATED METAL COMPOSITES, by J. H. Lauchner and D. G. Bennett. Rept. on Contract AF 18(603)28. Sep 58, 37p. 23 refs. Dept. of Ceramic Engineering rept. no. 83; AFOSR TR-58-129; AD-203 494.
Order from LC mi$3.00, ph$6.30 PB 138 624

Ceramic coated metal composites were studied under mechanically and thermally induced stresses. Coating metal interfacial structure considerations indicate a saturation of the glassy phase by oxides of the base metal accompanied by the presence of residual strain gradients essentially within the interfacial zone. The maximum induced strain (thermal or mechanical) which cobalt bearing ceramic coatings could withstand without fracture was found to be a function of residual stress.

Illinois U., Urbana.
METAL BONDED TITANIUM DIBORIDE, by James A. Nelson, Tracy A. Willmore and Dwight G. Bennett. Rept. on Ceramic Components for Aircraft Power Plants, Contract W33-038-ac-14520. Mar 52, 36p. 8 refs. Dept. of Ceramic Engineering rept. no. 61; WADC Technical rept. 52-111; ATI-158 806.
Order from LC mi$3.00, ph$6.30 PB 143 651

Titanium diboride in a finely divided state was combined with thirty percent of either powdered iron, cobalt, nickel, chromium, or zirconium and pressed into compacts which were fired in an argon atmosphere at temperatures exceeding the melting point of the added metal. The sintering characteristics of the compacts and the phases present after firing was described. Tests were made for oxidation resistance at 2000°F.

Illinois U., Urbana.
SOME STRUCTURE AND PROPERTY STUDIES OF RADIATION REFLECTIVE CERAMIC COATINGS, by Elwin Johnson, Henry G. Lefort and Dwight G. Bennett. Rept. on Contract AF 18(603)28. Sep 58, 52p. 4 refs. Dept. of Ceramic Engineering rept. no. 84; AFOSR TN-58-138; AD-204 555.
Order from LC mi$3.60, ph$9.30 PB 139 172

The behavior of crystalline CeO_2 in two types of matrix glass, one alkali and alumina rich and the other alkali and alumina free, plus a limited study of the chemical behavior of stabilized zirconia in matrix glasses of simple barium-boro-silicate type. The alkali and alumina bearing matrix glass showed a greater devitrification tendency than the alumina and alkali free glass.

Kennametal, Inc., Latrobe, Pa.
AN INVESTIGATION OF PHYSICAL PROPERTIES OF CEMENTED TITANIUM CARBIDE COMPOSITIONS, by J. C. Redmond, J. W. Graham and J. R. McVeigh. Final rept. on Ceramics, Components, Power Plant Aircraft, Contract AF 33(038)27732. Aug 52, 70p. WADC Technical rept. 52-235; AD-1116.
Order from LC mi$3.90, ph$10.80 PB 143 649

Stress-to-rupture tests were made on 15 TiC-base cermets at 1600° and 1800°F to determine their suitability as blading for aircraft gas turbines. Turbine-bucket-root configurations were designed and tested. Ni-bonded TiC was at least equal to currently used alloys in stress-to-rupture properties at present engine temperatures, and was superior at 1800°F. An Ni-Mo alloy doubled the stress-to-rupture strength of the TiC-base compositions. Fe-Si-alloy-bonded TiC was equivalent to Ni-bonded TiC in stress-to-rupture strength. The best bucket root designs, characterized by large radii and 1 or 2 serrations, showed strengths up to 5 times as great as those obtained with conventional fastenings.

Kennametal, Inc., Latrobe, Pa.
PRELIMINARY INVESTIGATION OF ULTRASONIC EXAMINATION OF CERMET TURBINE BUCKETS, by John C. Redmond and Alden M. Burchardt. Rept. on Contract AF 33(600)23285. Jan 56, 28p. WADC Technical rept. 56-89; AD-97 540.
Order from LC mi$2.70, ph$4.80 PB 130 366

Investigation of ultrasonic testing for detection of internal discontinuities in titanium carbide base cermet buckets or differences between buckets of the same composition. Development of methods for measuring sound velocities longitudinally in roots and for the detection of flaws within airfoil. Correlation between the results of ultrasonic examination, between metallurgical properties and also performance.

Minerals Research Lab., U. of California, Berkeley.
PREDICTING THE THERMODYNAMIC STABILITIES AND OXIDATION RESISTANCES OF SILICIDE CERMETS, by Alan W. Searcy. Technical rept. no. 5 on Contract Nonr-222(32). Sep 56, 17p. 8 refs. Series no. 84, issue no. 5.
Order from LC mi$2.40, ph$3.30 PB 128 604

Smith, A. O., Corp., Milwaukee, Wisc.
HIGH TEMPERATURE COATING RESEARCH, by M. K. Blanchard. 20 Nov 48, 10p. Rept. no. CRL-HTC-10; NEPA 835-AOS-10; AD-204 196.
Order from LC mi$1.80, ph$1.80 PB 138 319

Smith, A. O., Corp., Milwaukee, Wisc.
HIGH TEMPERATURE COATING RESEARCH, by M. K. Blanchard. 20 Dec 48, 11p. Rept. no. CRL-HTC-11; NEPA-857-AOS-11; AD-204 197.
Order from LC mi$2.40, ph$3.30 PB 138 324

See also PB 138 319

Burke Research Co., Warren, Mich.
RESEARCH ON VINYLIC FILLER LUBRICANTS AND GREASES, by U. F. Nager, M. T. Johnston and P. Davis. Technical rept. no. 19T, for 1 Oct-31 Dec 57 on Contract Nonr-2146(00). [1957] 16p. 5 refs. AD-157 360.
Order fromLC mi$2.40, ph$3.30 PB 138 627

The preparation of fluorinated oils by telomerization was continued. Several possible new routes to prepare fluorocarbon dinitriles were proposed for investigation. The following reactions were investigated: (1) vapor phase reaction of fluorohalogenocarbons with cyanides, (2) reactions of fluorohalogenocarbons with cyanides in solvents, (3) vapor phase pyrolysis of ammonium perfluoroglutarate in the presence of NH_3, and (4) reaction of perfluoroalkyl Li with cyanogen. (See also PB 138 884)

California Research Corp. [La Habra]
DEVELOPMENT OF HIGH-TEMPERATURE AIRCRAFT HYDRAULIC FLUIDS, by Neil W. Furby. Rept. on Hydraulic Fluids, Lubricants and Related Materials, Contract AF 33(038)9831. Nov 51, declassified. 111p. AF Technical rept. no. 6685; ATI-188 471.
Order from LC mi$6.00, ph$18.30 PB 143 267

The requirements for a nonflammable hydraulic fluid possessing favorable viscosity, volatility, and lubricity characteristics led to the investigation of the organo-silicates as possible new base materials to meet this demand. The studies conducted by the California Research Corporation have resulted in the synthesis of a number of siloxanes, disiloxanes, and organo-phosphorus compounds in an effort to develop a fluid that would meet the requirements as outlined in the three phases of their program. Data presented on mechanical test evaluation, viscosity-volatility relationships, viscosity-temperature characteristics, and fluid stability, indicate the potentiality of the organo-silicates as possible aircraft hydraulic fluids.

California Research Corp. [La Habra]
DEVELOPMENT OF HIGH-TEMPERATURE AIRCRAFT HYDRAULIC FLUIDS, by Neil W. Furby. Rept. on Hydraulic Fluids, Lubricants and Related Materials, Contract AF 33(038)9831, Oct 52, declassified 19 Oct 55. 62p. AF Technical rept. no. 6685, sup. 1; ATI 184 796.
Order from LC mi$3.90, ph$10.80 PB 143 267S1

A high temperature silicate base hydraulic fluid capable of operating from -65°F to over 400°F was formulated from a mixed monomer orthosilicate base stock, a silicone viscosity index improver, and a basic amine inhibitor to retard oxidation and hydrolysis. Various additives were evaluated for their effect on oxidation, viscosity, hydrolysis, lubricity, and flammability properties of silicate formulations. Further synthesis work was done on silicate and phosphonate esters as new base materials. Bench-scale wear tests and gear and piston type hydraulic pump tests were carried out on experimental hydraulic fluids. (See also PB 143 267)

California Research Corp. [La Habra]
DEVELOPMENT OF HIGH-TEMPERATURE AIRCRAFT HYDRAULIC FLUIDS, by Neil W. Furby. Rept. on Hydraulic Fluids and Lubricants MX 1576, Contract AF 33(038)9831. Sep 53, declassified 19 Oct 55. 85p. AF Technical rept. no. 6685, sup. 2; AD-22 067.
Order from LC mi$4.80, ph$13.80 PB 143 267S2

Progress for the year 1952 in the development of a high temperature aircraft hydraulic fluid for operation from -65°F to 400°F is described. Compounds synthesized for investigation as base materials included silicates, trisiloxanes, silicon-phosphorus compounds, phosphonates, and miscellaneous compounds. Diethyl and methylphenyl silicones as well as polymethacrylates were investigated as V. I. improvers for silicate base fluids. Additives were evaluated for effects on high temperature stability, hydrolytic stability, and antiwear properties. Four-ball wear tests and 3000 psi Vickers and New York Airbrake piston pump tests were conducted on several experimental fluids to determine lubricating properties. (See also PB 143 267S1)

Frankford Arsenal, Philadelphia, Pa.
MOLYBDENUM DISULFIDE DRY LUBRICANT STUDY, by B. Hawthorn. 31 Dec 57, 10p. Rept. no. MIC-68A; AD-147 783.
Order from LC mi$1.80, ph$1.80 PB 138 600

An evaluation was made of the performance of a particular brand of molybdenum disulfide suspension as a tool lubricant in small arms ammunition manufacturing operations, both with and without supplemental lubrication. No significant gain was reported.

Instituto Nacional de Tecnica Aeronautica Esteban Terradas (Spain).
AN EXPERIMENTAL INVESTIGATION ON THE COMBUSTION OF MONOPROPELLANT DROPLETS, by P. Pérez del Notario and C. Sánchez Tarifa. Rept. on Contract AF 61(514)997. 20 Jan 59, 26p. 4 refs. AFOSR-TN-59-628; AD-217 813.
Order from LC mi$2.70, ph$4.80 PB 143 171

In the present work the results of an experimental investigation with the object of obtaining the velocities of combustion of monopropellant droplets within an inert atmosphere are shown. This investigation was performed to check the theoretical results previously obtained.

Instituto Nacional de Tecnica Aeronautica "Esteban Terradas" (Spain).
FINAL REPORT, by G. Millan. Rept. on Contract AF 61(514)997. 25 Feb 59, 10p. 12 refs. AFOSR-TR-59-68; AD-217 815.
Order from LC mi$1.80, ph$1.80 PB 143 152

With regard to homogeneous combustion, the general objectives of the program of work were to contribute to the theoretical study of the characteristics of the laminar flames, taking the existing semianalytical methods as the starting point and including some non-steady cases, such as ignition of a combustible and homogeneous gaseous mixture, as well as others of flames with heat losses. As regards heterogenous combustion, the theoretical and experimental study of the combustion of monopropellant droplets, and of fuel sprays, was included in the program.

Midwest Research Inst. [Kansas City, Mo.]
A RADIOACTIVE TRACER INVESTIGATION OF THE MECHANISM OF MoS_2 AND WS_2 LUBRICATION, by. M. T. Lavik and S. L. Levy. Rept. on Contract AF 49(638)157. June 58, 8p. 2 refs. AFOSR TR-59-10; AD-209 493.
Order from LC mi$1.80, ph$1.80 PB 139 232

This project was designed to test Johnson's hypothesis describing lubrication by molybdenum disulphide.

Leather and Textiles

Harris Research Labs. [Washington, D. C.]
A SURVEY OF 18-OUNCE BLENDED SERGE FABRICS: LABORATORY EVALUATION, by John Menkart. Rept. on Air Force Textile Materials, Contracts DA 19-129-qm--1122; AF 33(616) (54-172; 55-82; 57-20). May 59, 50p. 21 refs. WADC Technical rept. 58-602; AD-214 699.
Order from OTS $1.25 PB 151 920

The development of alternates for the 18 oz. wool serge was the object of the investigation. Twenty experimental fabrics were made and their properties were evaluated, in comparision with those of the standard serge, at Quartermaster Research and Engineering Center, Natick, Mass. On the basis of the laboratory data, tentative recommendations are made for the selection of alternates, resulting in a conservation of wool, with the least change in functional properties. Of the fabrics studied, a ternary blend of 70% wool, 20% viscose, and 10% nylon is indicated as providing the closest approach to the wool serge.

Institute of Polymer Research, Polytechnic Inst. of Brooklyn, N. Y.
IMPROVEMENT OF THERMAL STABILITY OF TEXTILE FIBERS, by I. Saad. Progress rept. no. 8 (Annual summary) for 1 July 57-30 June 58 on Contract N140(132)57745B. [1958] 32p.
Order from LC mi$3.00, ph$6.30 PB 143 086

Within the limits of the work one arrives at the conclusion that substantial coatings by the method of embedding catalyst in the fiber surface are feasible, and that the amount of deposited polymer may be increased and its uniformity improved by the application of larger concentrations of catalyst and by shortening the coating treatment. (See also PB 132 855)

Owens-Corning Fiberglas Corp., Newark, Ohio.
PROPERTIES OF GLASS FIBERS AT ELEVATED TEMPERATURES, by W. H. Otto. Quarterly rept. no. 4, 16 Mar-15 June 59, on Contract NOas-58-841-c. 25 June 59, 20p.
Order from LC mi$2.40, ph$3.30 PB 143 669

Single fiber tensile strength measurements were made on silica monofilament at temperatures from 75°F to 2000°F. Static fatigue measurements on silica fibers were made at temperatures up to 1830°F. The effects of standard 630 textile size on high temperature strength and fatigue were studied on E-glass and X-37B glass.
(See also PB 140 701)

Paints and Finishes

Aberdeen Proving Ground, Md.
DEVELOPMENT OF A ONE-COAT FINISH FOR SPRAY APPLICATION TO TIN AND TERNE PLATE, by C. U. Van Duyne and C. F. Pickett. Rept. no. 6 on Finishing Coats Systems, Ordnance Proj. no. TB4-771D. 29 July 55, 28p. Engineering Labs. rept. no. 4.
Order from LC mi$2.70, ph$4.80 PB 138 949

The object of this project is to develop a quick drying one-coat finish for spray application on tin and terne plate containers which will be sufficiently dry after a one-minute bake at 300°F to permit handling and packaging of the containers. A two-coat finishing system for spray painting tin and terne plate containers as recommended by this installation was deemed too lengthy an operation by various can manufacturers. After materials covered by existing specifications were evaluated and found to be unsatisfactory a new product was developed meeting the specific requirements of the problem.

Bureau of Aeronautics, Dept. of the Navy, Washington, D. C.
MINUTES OF COLLOQUIUM ON AIRCRAFT ORGANIC PROTECTIVE COATINGS PROBLEMS OF THE BUREAU OF AERONAUTICS, FEBRUARY 27-28, 1947. 125p.
Order from LC mi$6.30, ph$19.80 PB 143 089

A series of papers are covered as well as some of the discussion.

Coating and Chemical Lab., Aberdeen Proving Ground, Md.
DETERMINATION OF CHLORENDIC ACID IN FIRE RETARDANT PAINT, by G. G. Esposito. 14 Aug 59, 7p. Rept. no. CCL-80.
Order from LC mi$1.80, ph$1.80 PB 143 564

A new test method is presented for determining chloredic (hexachloroendomethylenetetrahydrophthalic) acid in chlorinated alkyd resins used in fire retardant paints. The new procedure employs isopropyl alcohol

in the saponification medium to separate the acid as the dipotassium salt. The acid is extracted from water with ethyl ether and titrated in a nonaqueous medium.

Photographic Materials

Rome Air Development Center, Griffiss AFB, N. Y.
THE APPLICATION OF DIAZO TYPE MATERIALS TO INDUSTRIAL PLANNING AND ENGINEERING, by George F. Sztuk. Oct 58, 15p. RADC-TN-58-250; AD-202 097.
Order from LC mi$2.40, ph$3.30 PB 138 622

The Maintenance Engineering Plant Layout Standardization Program requires the use of Diazo type color materials for the production in Diazo machines of colored overlay plant layouts and their blue line reproductions. RADC has conducted tests to establish specifications for the Diazo color foils to be supplied by two commercial firms and has assisted in revising plant equipment color classifications. The general results of these tests and consequent recommendations are given in this report.

Technical Operations, Inc., Burlington, Mass.
THE PHOTOGRAPHIC IMPLICATIONS OF THE CHEMISTRY OF QUINONE, FOG, ACCELERATED, CONTAGIOUS, INFECTIOUS AND SUPERADDITIVE DEVELOPMENT, LATENSIFICATION AND DESENSITIZATION, by James E. LuValle and Gershon M. Goldberg. Technical note on Contract AF 18(600)371. 31 July 58, 25p. 11 refs. Rept. no. TOI 58-28; AFOSR TN-58-723; AD-162 258.
Order from LC mi$2.70, ph$4.80 PB 138 879

Plastics

Bjorksten Research Labs., Inc. [Madison, Wis.]
WEATHERING TESTS OF PLASTICS AND DESIGN OF SUSPENDED ENVELOPE SOLAR STILLS. Rept. on OSW Contract 14-01-001-91. Sep 59, 46p. 3 refs. Office of Saline Water Research and Development progress rept. no. 30.
Order from OTS $1.50 PB 161 095

A program for investigation of the resistance of plastic film materials to solar radiation and weathering under distillation conditions was carried on through the use of accelerated laboratory tests as well as outdoor exposure tests. Sample containers affording protection of the film specimens while subjecting them to distillation conditions were developed, and an accelerated testing device constructed which appears suitable for rapid screening of materials, though direct correlation with outdoor exposure can not be established as yet. The program was subsequently extended to include preliminary design, construction, and initial testing of suspended envelope stills in modular unit form. A design was developed which utilizes commercially available structural elements requiring a minimum amount of fabrication into still modules. Available plastic materials having superior resistance to exposure presented extensive problems in effective sealing.

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
HEAT OF POLYMERIZATION OF EPON 828, by Charles Lenchitz, Ronald Brown and Salvatore Stivala. June 58, 13p. 2 refs. Technical rept. 2505.
Order from LC mi$2.40, ph$3.30 PB 138 924

The heat of polymerization of Epon was measured with ethylenediamine (EDA), diethylenetriamine (DETA), and triethylene tetramine (TETA). The results obtained are compared with calculations made from the heats of formation of the reactants and the products.

Frick Chemical Lab., Princeton U., N. J.
MOLECULAR WEIGHT DISTRIBUTION BY STRESS RELAXATION, by A. V. Tobolsky, A. Mercurio and K. Murakami. Rept. on Contract Nonr-1858(07). 26 Feb 58, 3p. 3 refs. ONR Technical rept. RLT-23.
Order from LC mi$1.80, ph$1.80 PB 139 054

The stress relaxation properties of linear amorphous polymers in the region of rubbery flow have been shown to be dependent on molecular weight and molecular weight distribution.

Wood and Paper

College of Forestry, Syracuse, N. Y.
MECHANISM OF SOLUTION OF HEMICELLULOSE IN ALKALI, by Igor Sobolev (Doctoral thesis) and Conrad Schuerch. Technical rept. no. 2, May-July 58, on Contract DA 30-115-ORD-923. [1958] 25p. 19 refs. AD-137 112.
Order from OTS $0.75 PB 151 177

When wood is pulped with sodium hydroxide and the liquors are simultaneously hydrogenated in the presence of nickel catalyst, the process resembles soda pulping very closely in the species usable, the optimum conditions, alkali consumption and pulp yield and analysis. However, the lignin is a relatively simple mixture of distillable phenols and thermoplastic resins, and the pulp appears somewhat lighter in color than comparable soda pulp. The process can be carried out effectively on wood meal or chips and with the catalyst separate from the wood. Hydrogen pressure need only be about 600 p. s. i. Lignin hydrogenated in this fashion appears to be a more attractive material than that produced from the hydrogenation of pulping liquors or commercial lignins. A number of experimental pulps are described. (See also PB 142 747)

Rock Island Arsenal Lab., Ill.
DETERMINATION OF SAMPLE SIZES FOR TESTING OF MIL-P-10831A, TYPE I TARGET PAPER, by Evelyn S. Burke. 28 May 59, 20p. Rept. no. 59-1440; AD-216 527.
Order from LC mi$2.40, ph$3.30 PB 143 332

Royal Inst. of Tech. (Sweden).
STUDIES ON THE HEARTWOOD CONSTITUENTS OF CONIFERS, Final technical rept. no. 1 for 1 Feb 58-31 Mar 59 on Contract DA 91-508-euc-288. 25 Apr 59, 48p. 6 refs. AD-217 432.
Order from LC mi$3.30, ph$7.80 PB 143 051

Three South African and one South American species of the genus Podocarpus were examined but no interesting substances were found. The South American Saxegothea conspicua was also investigated without yielding any results of interest. Investigation of the heartwood constituents of the Chilean Austrocedrus (Libocedrus) chilensis was made. The heartwood of the Tasmanian Arthrotaxis selaginoides was investigated for the first time. The old problem of the structure of shonanic acid from the Formosan conifer Libocedrus formosana has been solved. The heartwood of the Moroccan Tetraclinis articulata has been reinvestigated. There is no clear-cut relationship to the South African genus Widdringtonia nor does Tetraclinis exhibit any relationship to Callitris, an Australian genus to which Tetraclinis articulata was once supposed to belong. There is, however, some affinity to the northern genera of Cupressaceae and chemically perhaps it is related most closely to the Californian incense cedar, Libocedrus decurrens. Tetraclinis should be very carefully investigated. It appears to be a rich source of chemotaxonomically interesting compounds. The heartwoods of the Californian Cupressus macrocarpa and the Himalayan C. torulosa were subjected to preliminary investigation.

MATHEMATICS

Aeronautical Research Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
ASYMPTOTIC SOLUTIONS FOR DIFFERENTIAL EQUATIONS WITH A REGULAR SINGULAR POINT, by K. G. Guderley. Feb 59, 85p. 6 refs. WADC Technical rept. 58-617.
Order from OTS $2.25 PB 161 071

Air Force Cambridge Research Center, Bedford, Mass.
A METHOD FOR NUMERICAL EVALUATION OF THE COEFFICIENTS OF FOURIER SERIES, by Kurt H. Haase. June 59, 38p. 8 refs. AFCRC-TR-153; AD-216 366.
Order from LC mi$3.00, ph$6.30 PB 143 492

Programmed computation of these periodic Fourier coefficients in connection with the tabulation of $C_n(m)$ yields any desired number of Fourier coefficients. This new method is thus superior to other computational methods and schemes that a priori limit the number of obtainable coefficients. Fourier coefficients of specially selected orders can be obtained in a few steps, without the necessity of computing the entire sequence of coefficients. The method can be programmed for desk calculating machines as well as for computers.

Applied Mathematics and Statistics Lab., Stanford U., Calif.
COINCIDENCE PROBABILITIES, by Samuel Karlin and James McGregor. Technical rept. no. 8 on Contract Nonr-225(28). 17 Nov 58, 46p. 20 refs.
Order from LC mi$3.30, ph$7.80 PB 143 479

Applied Mathematics and Statistics Lab., Stanford U., Calif.
COINCIDENT PROPERTIES OF BIRTH AND DEATH PROCESSES, by Samuel Karlin and James McGregor. Technical rept. no. 9 on Contract Nonr-225(28). 18 Nov 58, 51p. 9 refs.
Order from LC mi$3.60, ph$9.30 PB 143 478

In this paper we investigate certain aspects of the structure of the Markov process describing the transitions of n particles conditioned that no coincidence takes place. We refer to this process as the compound birth and death process of order n. Frequently, when no ambiguities arise the terms "birth and death" and "order n " will be suppressed. The basis of the subsequent analysis is principally an integral representation for $P\begin{pmatrix} t; & i_1, i_2, \ldots, i_n \\ & j_1, j_2, \ldots, j_n \end{pmatrix}$ which is derived from a corresponding integral formula for $P_{ij}(t)$.

Applied Mathematics and Statistics Lab., Stanford U., Calif.
CONTINUOUS SAMPLING PROCEDURES WITHOUT CONTROL, by C. Derman, M. V. Johns, Jr., and G. J. Lieberman. Technical rept. no. 39 on Contract N6onr-25126. 10 Oct 58, 32p. 4 refs.
Order from LC mi$3.00, ph$6.30 PB 143 248

Several modifications of the Dodge CSP-1 procedure are presented. Changes are made in the rule of action when a defective item is observed while on sampling. The Average Outgoing Quality Limit (AOQL) for these new procedures are derived without the assumption of control. These results are compared with the AOQL assuming control. Further, the AOQL for the CSP-1 procedure using probability sampling (looking at every item with probability 1/k when on sampling) is derived without the assumption of control.

Applied Mathematics and Statistics Lab., Stanford U., Calif.
ON NULL-RECURRENT MARKOV CHAINS, by John Lamperti. Technical rept. no. 22 on Contract Nonr-225(21). 10 Nov 58, 21p. 9 refs.
Order from LC mi$2.70, ph$4.80 PB 143 482

Applied Mathematics and Statistics Lab., Stanford U., Calif.
THE SUPREMUM AND INFIMUM OF THE POISSON PROCESS, by Ronald Pyke. Technical rept. no. 39 on Contract N6onr-25140. 21 Mar 58, 17p. 9 refs.
Order from LC mi$2.40, ph$3.30 PB 139 296

British Columbia U. (Canada).
EXTREMAL PROPERTIES OF HERMITIAN MATRICES II [AND] LINEAR TRANSFORMATIONS ON ALGEBRAS OF MATRICES, by Marvin Marcus and B. N. Moyls. Rept. on Contract AF 18(603)83. Aug 58, 21p. 3 refs. AFOSR TN-58-(667, 668); AD-162 200; AD-162 199.
Order from LC mi$2.70, ph$4.80 PB 139 156

Brown U. Div. of Applied Mathematics, Providence, R. I.
A SUBROUTINE FOR CALCULATION OF SPHERICAL BESSEL FUNCTIONS, by Cornelia M. Kalkman. Technical rept. no. 16 on Contract Nonr-562(07). Oct 58, 10p. 562(07)/16.
Order from LC mi$1.80, ph$1.80 PB 143 786

California U., Berkeley.
INFINITELY MULTIPLE VALUED HARMONIC FUNCTIONS IN SPACE WITH TWO BASE BRANCH CURVES OF ORDER ONE, by Griffith C. Evans. Technical rept. no. 29 on Contract Nonr-222(37). Nov 58, 61p. 5 refs.
Order from LC mi$3.90, ph$10.80 PB 143 409

Carnegie Inst. of Tech., Pittsburgh, Pa.
SEMI-DISCRETE POTENTIAL THEORY, by R. L. Helmbold. Technical rept. no. 34 on Mathematical Analysis of Electrical and Mechanical Systems Contract DA 36-061-ORD-490. 29 Apr 57, 69p. 22 refs. CIT-ORD-6D-TR34; AD-135 262.
Order from LC mi$3.90, ph$10.80 PB 138 632

The equations of a relatively new variant of the difference-equation method of approximately solving problems in partial differential equations are investigated, the discussion being restricted to partial differential equations involving the Laplace operator. The variant consists, for the two dimensional case, in replacing one of the partial derivatives by a central difference and the other partial derivative by an ordinary derivative, thus obtaining a system of ordinary differential equations to be solved in such a way as to satisfy certain boundary conditions. It is shown that the equations of this variant are equivalent to a variational principle, the analogue of the maximum principle holds, and an operational calculus is developed. Also included are a Green's function and Green's identities, applications to the estimation of eigenvalues, and explicit solutions in rectangular regions. Generalizations to higher dimensions are indicated.

Columbia U., New York.
ON STOCHASTIC APPROXIMATION, by C. Darman and J. Sacks. Rept. on Contracts Nonr-266(55, 51). Nov 58, 8p. 7 refs. CU 2-58-Nonr-266(51)MS.
Order from LC mi$1.80, ph$1.80 PB 143 480

Columbia U., New York.
A THEOREM ON CONVEX BODIES AND APPLICATIONS TO BANACH SPACES, by Aryeh Dvoretzky. Rept. on Contract Nonr-266(51). [1958] 8p. 4 refs. CU-1-58-Nonr-266(51)-MS.
Order from LC mi$1.80, ph$1.80 PB 143 468

Cornell U., Ithaca, N. Y.
ASYMPTOTIC EXPANSIONS IN GLOBAL LIMIT THEOREMS, by Ralph Palmer Agnew. Rept. no. 63 on Contract AF 18(600)685. Dec 56, 34p. 7 refs. AFOSR-TN-56-514; [AD-110 329].
Order from LC mi$3.00, ph$6.30 PB 139 024

Institute for Advanced Study, Princeton, N. J.
ON A CONJECTURE OF H. HADWIGER, by Branko Grünbaum. Rept. on Contract AF 49(638)253. Nov 58, 7p. 7 refs. AFOSR-TN-58-1055; AD-206 983.
Order from LC mi$1.80, ph$1.80 PB 139 073

Institute for Advanced Study, Princeton, N. J.
SEMINARS ON ANALYTIC FUNCTIONS, VOLUME I, SEPTEMBER 2-14, 1957. Rept. on Contract AF 18(603)118. [1957] 349p. 212 refs. AFOSR-TN-58-750; AD-201 502.
Order from LC mi$11.10, ph$53.10 PB 143 754

Contents:
Seminar 1. Theory of Functions of Several Complex Variables
Seminar 2. Conformal Mapping and Schlicht Functions

Institute for Advanced Study, Princeton, N. J.
SEMINARS ON ANALYTIC FUNCTION, VOLUME II, SEPTEMBER 2-14, 1957. Rept. on [Contract AF 18(603)118]. [1957] 320p. 107 refs. AFOSR-TN-58-750; AD-201 502.
Order from LC mi$11.10, ph$48.60 PB 143 755

Contents:
Seminar 3. Riemann Surfaces
Seminar 4. Theory of Automorphic Functions
Seminar 5. Analytic functions as Related to Banach Algebras
(See also PB 143 754)

Institute of Mathematical Sciences, New York U., N. Y.
THE EVALUATION OF TWO AND THREE-CENTER INTEGRALS ARISING IN CALCULATIONS ON MOLECULAR STRUCTURE, by C. Donald LaBudde and R. C. Sahni. Rept. on Contract AF 19(604)1705. Sep 58, 44p. 8 refs. Research rept. no. CX-35; AFCRC TN-58-601.
Order from LC mi$3.30, ph$7.80 PB 138 859

Institute of Statistics, North Carolina State Coll., Raleigh.
ASYMPTOTIC DISTRIBUTION OF SAMPLE SIZE FOR CERTAIN METHODS OF SEQUENTIAL SAMPLING, by L. L. Leaman and E. J. Williams. Technical rept.

no. 21 on Experimental Designs for Industrial Research, Contract DA 36-034-ORD-1517. June 58, 66p. 30 refs. AD-200 572.
Order from LC mi$3.90, ph$10.80 PB 142 862

Institute of Statistics, North Carolina State Coll., Raleigh.
AN INVESTIGATION OF ROBUSTNESS TO NON-NORMALITY OF CRITERIA FOR TESTING OUTLYING OBSERVATIONS, by W. L. Davis and R. J. Hader. Technical rept. no. 20 on Contract DA 36-034-ORD-1517. June 58, 47p. 23 refs. AD-200 571.
Order from LC mi$3.30, ph$7.80 PB 143 688

The results of this study may be summarized as follows: (1) All statistics under study are fairly sensitive to non-normality. (2) The sensitivity increases with increasing sample size. (3) There was no evidence to indicate that one statistic or a group of statistics is any less sensitive to non-normality than any other.

Institute of Statistics, U. of North Carolina, Chapel Hill.
ON THE CONSTRUCTION OF PAIRWISE ORTHOGONAL SETS OF LATIN SQUARES AND THE FALSITY OF A CONJECTURE OF EULER, II, by R. C. Bose and S. S. Shrikhande. Rept. on Contract AF 49(638)213. May 59, 13p. 3 refs. Mimeograph series no. 225; AFOSR TN-59-518; AD-216 239.
Order from LC mi$2.40, ph$3.30 PB 143 028

Institute of Tech., U. of Minnesota, Minneapolis.
A BOUNDARY VALUE PROBLEM FOR A SYSTEM OF ORDINARY LINEAR DIFFERENTIAL EQUATIONS INVOLVING POWERS OF A PARAMETER, by William A. Harris, Jr. Technical rept. no. 3, 16 Mar-15 June 57, on Contract DA 11-022-ORD-2042. 20 Mar 58, 141p. 9 refs. AD-156 723.
Order from LC mi$7.20, ph$22.80 PB 143 258

This paper is concerned with the existence and nature of eigenvectors which are solutions of a vector differential equation of the form

$$\frac{d}{dx}\,\bar{y}(x,\lambda) = A(x,\lambda)\,\bar{y}(x,\lambda) + \bar{g}(x,\lambda),\quad q \le x \le b,$$

with the boundary conditions

$$W_a(\lambda)\,\bar{y}(q,\lambda) + W_b(\lambda)\,y(b,\lambda) = 0.$$

The $A(x,\lambda)$, $W_a(\lambda)$ and $W_b(\lambda)$ are n x n matrices which possess convergent representations of the form

$$A(x,\lambda) = \lambda^h \sum_{j=0}^{\infty} A_j(x)\,\lambda^{-j}$$

$$W_a(\lambda) = \lambda^k \sum_{j=0}^{\infty} W_{aj}\,\lambda^{-j}$$

$$W_b(\lambda) = \lambda^l \sum_{j=0}^{\infty} W_{bj}\,\lambda^{-j}$$

when the complex parameter λ is sufficiently large; h is a positive integer and k is a non-negative integer.

Institute of Tech., U. of Minnesota, Minneapolis.
SIMPLIFICATIONS OF SYSTEMS OF LINEAR DIFFERENTIAL EQUATIONS INVOLVING A TURNING POINT, by H. L. Turrittin and W. A. Harris, Jr. Technical rept. no. 2, 15 Sep 57-15 Sep 58, on Contract DA 11-022-ORD-2042. 13 Dec 57, 39p. 42 refs. AD-156 171.
Order from LC mi$3.00, ph$6.30 PB 143 257

It is found that an asymptotic reduction in the order of the matrix equation

(1) $\epsilon^h \frac{dX}{dt} = \{A_0(t) + \epsilon A_1(t) + \epsilon^2 A_2(t) + \ldots\} X$, where h is a positive integer, ϵ a small parameter, and the A's are square matrices with holomorphic elements near $t = 0$, is always possible if the characteristic roots $\lambda_i(t)$ of the lead matrix $A_0(t)$ can be separated into two distinct sets, so that no root of the first set coincides with any root of the second set at or near $t = 0$. Also all turning point problems for equations of type (1), where the A's are 2 by 2 matrices, have been classified and reduced to one of three possible canonical forms.

Johns Hopkins U., Baltimore, Md.
RECENT WORK ON FAMILIES OF PERIODIC SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS, PART I; SINGULAR SOLUTIONS OF SYSTEMS OF REAL ANALYTIC EQUATIONS, PART II; [AND] THE STRÖMGREN-WINTNER PRINCIPLE ON THE TERMINATION OF FAMILIES OF PERIODIC SOLUTIONS, by Daniel C. Lewis, Jr. Rept. on Contract AF 18(600)665. 30 June 59, 63p. 14 refs. AFOSR-TR-59-70.
Order from LC mi$3.90, ph$10.80 PB 143 151

Laboratory of Statistical Research, U. of Washington, Seattle.
ON THE GROWTH OF STOCHASTIC PROCESSES, by Albert W. Marshall. Technical rept. no. 32 on Contract Nonr-477(11). 20 Oct 58, 79p. 15 refs.
Order from LC mi$4.50, ph$12.30 PB 143 797

Midwest Research Inst. [Kansas City, Mo.]
THE PADÉ TABLE AND THE τ-METHOD, by Yudell L. Luke. Rept. on Contract AF 49(638)66. Aug 57, 45p. 24 refs. AFOSR TN-57-570; AD-136 555.
Order from LC mi$3.30, ph$7.80 PB 130 733

Rational function representations of the function E are presented as defined by a differential equation of a standard form. Closed form expressions for the error are derived and used to appraise the error in a convenient manner. Rational approximations to the transcendents defined by the differential equation are derived by the τ method. Numerical examples are worked out and the true error is compared with that predicted.

Minnesota U. School of Business Administration, Minneapolis.
SURVEY OF NONPARAMETRIC STATISTICS, by I. Richard Savage. Special rept. no. 1 on Contract Nonr-2582(00). 6 Nov 58, 10p. 21 refs.
Order from LC mi$1.80, ph$1.80 PB 143 459

North Carolina U., Chapel Hill.
MATRIX INVERSION, ITS INTEREST AND APPLICATION IN ANALYSIS OF DATA, by B. G. Greenberg and A. E. Sarhan. Technical rept. no. 5 on Estimation of Parameters by Order Statistics, Contract DA 36-034-ORD-2184. 15 May 58, 21p. 7 refs.
Order from LC mi$2.70, ph$4.80 PB 143 561

Matrix inversion is used in the least squares analysis of data to estimate parameters and their variances and covariances. When the data come from the analysis of variance, analysis of covariance, order statistics, or the fitting of response-surfaces, the matrix to be inverted usually falls into a structured pattern that simplified its inversion.

Oregon U., Eugene.
REGULAR MEASURES AND STOCHASTIC PROCESSES IN TOPOLOGICAL GROUPS, by R. P. Pakshirajan. Technical rept. no. 2 on Contract DA 04-200-ORD-651. 26 May 59, 57p. 13 refs.
Order from LC mi$3.60, ph$9.30 PB 143 055

Purdue Research Foundation, Lafayette, Ind.
COMMUTATORS AND ABSOLUTELY CONTINUOUS OPERATORS, by C. R. Putnam. Technical note no. 1 on Commutators on a Hilbert Space, Contract AF 18(603)139. July 57, 17p. 10 refs. AFOSR-TN-56-457; AD-97 073.
Order from LC mi$2.40, ph$3.30 PB 128 628

A discussion is presented of commutators and absolutely continuous operators. Five general theorems on commutators and certain associated sets are given, and applications of some of the results are made to prove 8 theorems dealing with Toeplitz, Hankel, and Jacobi matrices. All operators are bounded linear transformations on a Hilbert space consisting of elements x. The results obtained depend on the methods of C. R. Putnam (Proc. Amer. Math. Soc., 7:1026-1030, 1956), and are similar to those results except for the second and third commutators.

Stanford U., Calif.
THE ADMISSIBILITY OF PITMAN'S ESTIMATOR OF A SINGLE LOCATION PARAMETER, by Charles Stein. Technical rept. no. 20 on Contract Nonr-225(21). 15 Oct 58, 19p. 10 refs.
Order from LC mi$2.40, ph$3.30 PB 143 791

Stanford U., Calif.
DEGENERACY IN LINEAR PROGRAMMING: WHERE IS THE PROBLEM? by Harvey M. Wagner. Technical rept. no. 49 on Contract N6onr-25133. 3 Mar 58, 12p. 9 refs.
Order from LC mi$2.40, ph$3.30 PB 139 160

The degeneracy problem, which may or may not arise when the degeneracy condition exists, is of two sorts. The first type concerns the rigorous demonstration that the simplex method unequivocally leads to an optimal solution. The second type concerns the amount of computational effort which should be expended to avoid a theoretically possible but empirically rare occurrence. Nelson's resolution of the problem neither solves the first aspect completely nor the second aspect adequately. The common occurrence of the degeneracy conditions, for reasons explained by Nelson, in contrast to the infrequent occurrence of cycling, has led practitioners to be less exacting in the requirements of their computational scheme than the mathematicians have been in the details of their logical proofs.

Trinity Coll., Hartford, Conn.
REGULARITY PRESERVING FACTOR SEQUENCE TRANSFORMATIONS OF SERIES OF CHARACTERISTIC FUNCTIONS OF THE DIFFERENTIAL OPERATOR $z^N - d^2/dz^2$, by W. J. Klimczak. Rept. on Contract AF 18(600)1397. 30 Nov 58, 24p. 4 refs. AFOSR TN-58-1059; AD-206 990.
Order from LC mi$2.70, ph$4.80 PB 139 083

The purpose of this paper is to study some special types of regularity preserving factor sequence transformations for series of the form

$$f(z) = \sum_{n=0}^{\infty} f_n \, w_n(z),$$

where the $w_n(z)$ are characteristic functions of the second-order differential operator

$$\mathcal{E}_z = z^N - d^2/dz^2,$$

N being a positive integer.

University Coll., Cork (Eire).
ON A CLASS OF FUNCTIONS REGULAR AND BOUNDED IN THE UNIT CIRCLE, by P. B. Kennedy. Technical note no. 5 on Contract AF 61(514)1399. [1953] 17p. 5 refs. AFOSR TN-59-670; AD-218 382.
Order from LC mi$2.40, ph$3.30 PB 143 167

University Coll., Cork (Eire).
A PROPERTY OF BOUNDED REGULAR FUNCTIONS, by P. B. Kennedy. Technical note no. 4 on Contract AF 61(514)1399. [1953] 17p. 4 refs. AFOSR TN-59-669; AD-218 381.
Order from LC mi$2.40, ph$3.30 PB 143 168

For a bounded regular function f(z) in the unit circle $|z| < 1$, an investigation is made of the relation between the growth of the Nevanlinna characteristic of the derivative of f and the angular measure of the set of singularities of f on $|z| = 1$.

Washington U., St. Louis, Mo.
DETERMINANTS IN MULTIVARIATE CORRELATION, by E. Muriel J. Ferguson, Winton H. Manning, and Philip H. DuBois. Technical rept.

no. 5 on Contract Nonr-816(02). Apr 58, 15p. 20 refs.
Order from LC mi$2.40, ph$3.30 PB 138 604

Washington U., Seattle.
NORMALITY AND REAL COMPACTIFICATION FOR SUBSETS OF PRODUCT SPACES, by H. H. Corson. Technical rept. no. 1 on Contract Nonr-477(22). 1 Nov 58, 15p. 8 refs.
Order from LC mi$2.40, ph$3.30 PB 143 467

Washington U., Seattle.
A THEOREM ON SEMI-CONTINUOUS SET-VALUED FUNCTIONS, by E. Michael. Technical rept. no. 4 on Contract Nonr-477(21). Dec 58, 9p. 4 refs.
Order from LC mi$1.80, ph$1.80 PB 143 607

Computing Devices

Air Proving Ground Center, Eglin AFB, Fla.
TELEMAG - A SYSTEM FOR PROCESSING TEST DATA RECORDED ON MAGNETIC TAPE, by James L. Blilie. June 59, 77p. APGC-TN-59-21; AD-214 632.
Order from LC mi$4.50, ph$12.30 PB 143 290

This report describes Telemag, a system which is used to process test data which may have been recorded on magnetic tape in the test vehicle, telemetered to a ground station or the Telemag and recorded, or telemetered and fed directly to Telemag. The report also presents a brief review of some telemetry and magnetic tape data recording techniques. The last two chapters deal respectively with the actions to be taken by people to best utilize Telemag and plans for expanding the facilities and functions of Telemag.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
SIMULTANEOUS EQUATION ROUTINES FOR THE ORDVAC AND EDVAC, by Bailey T. Wade. Mar 56, 66p. Memo. rept. no. 987.
Order from LC mi$3.90, ph$10.80 PB 128 524

Bell Telephone Labs., Inc. [New York]
LEPRECHAUN: A SOLID-STATE DIGITAL COMPUTER, by J. A. Githens and M. J. Gilmartin. Supplement to Summary engineering rept. for 1 May 57-1 Aug 58 on Tradic Computer Research (Second Stage), Contract AF 33(600)34977. 1 Dec 58, 460p. AD-208 622.
Order from LC mi$11.10, ph$69.60 PB 143 648S

The TRADIC second feasibility computer, better known as LEPRECHAUN, is a high-speed solid-state digital computer capable of solving complex weapons guidance control problems in real-time. The computer was designed and built to meet several definite objectives. Firstly, the computer was built to demonstrate the feasibility of direct-coupled transistor logic (DCTL) used in a system involving thousands of transistors. The machine also provides for the test and evaluation of a moderately large magnetic-core memory driven by transistors. It serves as a vehicle for the continuing study and evaluation of the operating characteristics and reliability of transistors in these techniques. Secondly, LEPRECHAUN was designed for use in programming and logical design research in the use of digital computers for military real-time control applications. To meet this last objective, the computer incorporates some novel features which permit extreme flexibility in the logical interconnections. This supplement gives complete details of the design and construction of the LEPRECHAUN computer. (See also PB 143 648)

Bell Telephone Labs., Inc. [New York]
TRADIC COMPUTER RESEARCH (SECOND STAGE) by J. A. Githens and M. J. Gilmartin. Summary engineering rept. for 1 May 57-1 Aug 58 on Contract AF 33(600)34977. 1 Dec 58, 398p. 62 refs. AD-208 621.
Order from LC mi$11.10, ph$60.60 PB 143 648

This report summarizes the program for the development of solid-state technology for airborne weapons-control computers. Among the major items covered are: encoding and decoding techniques; two forms of non-destructive program storage; a wide temperature range magnetic core memory system; silicon direct coupled transistor logic; organization of a computer as an aid in trouble location; and programming techniques for the protection of stored constants and error correction in the weapons-control computer.

International Telemeter Corp., Los Angeles, Calif.
DIGIT DETECTOR. Technical rept. no. 20 [on Contract AF 30(602)1566] 14 Nov 57, 41p. RADC-TN-58-10; AD-148 543.
Order from LC mi$3.30, ph$7.80 PB 143 282

Information is recorded on the glass disc as opaque or transparent marks in a photographic emulsion. The disc is rotated past a small scanning spot of light. The information is read by a photomultiplier tube (PMT) which catches the beam from the spot after passage through the emulsion. A transparent ("white") mark gives a high current and an opaque ("black") mark gives a low current. The Digit Detector accepts the sequence of high and low currents from the PMT and announces to the search-logic electronics what information the spot is seeing. The information is stored in the memory, as photographic opaque or transparent marks, essentially in a binary code. Hence the output of the Digit Detector will be a sequence of impulses representing the two binary characters 0 or 1. The search logic groups these into lots of six and identifies them as characters or other graphical symbols.

International Telemeter Corp., Los Angeles, Calif.
WORD LIST FOR MECHANICAL TRANSLATION SYSTEM, MARK I. Technical rept. no. 10 on Computer Set, General Information Data AN/GSQ-16 (XW-1) (Photoscopic Information Storage Unit), Contract

AF 30(602)1566. 20 Mar 57, 17p. RADC-TN-57-201; AD-114 496.
Order from LC mi$2.40, ph$3.30 PB 143 283

The report is divided into 3 parts as follows:
Fundamental considerations of word list preparation
Simulated translation
Using University of Washington word list & orig. text
Using modified University of Washington word list & original text
Using modified University of Washington word list & technical text
Excerpts from word lists
University of Washington word list
Modified University of Washington word list

Naval Ordnance Test Station, China Lake, Calif.
AN INTRODUCTION TO LINEAR PROGRAMMING WITH APPLICATIONS TO DATA REDUCTION PROBLEMS, by Frank Reed. Dec 57, 42p. 8 refs. NOTS-1932; NAVORD rept. 5838.
Order from LC mi$3.30, ph$7.80 PB 143 341

This paper presents an introduction to the mathematical theory of linear programming. The material covered is sufficient to enable the applied mathematician to solve a great number of practical problems. As illustrations of the usefulness of the technique, two problems related to the field of data reduction are solved.

[Remington Rand Univac Div., Sperry Rand Corp., St. Paul, Minn.]
[COMPUTER SURVEY]. Bimonthly Progress rept. no. 5, pt. 1, 1 May-1 July 47, on Contract N6onr-240, T.O.I. [1947] 37p. 4 refs. AD-205 033.
Order from LC mi$3.00, ph$6.30 PB 143 778

[Remington Rand Univac Div., Sperry Rand Corp., St. Paul, Minn.]
[COMPUTER SURVEY]. Bimonthly Progress rept. no. 8, 1 Nov-31 Dec 47, on Contract N6onr-240(01). [1948] 15p. AD-205 017.
Order from LC mi$2.40, ph$3.30 PB 143 779

(See also PB 143 778)

[Remington Rand Univac Div., Sperry Rand Corp., St. Paul, Minn.]
LOGISTIC PAPERS. ISSUE NO. 5, by C. Tompkins and W. W. Stifler, Jr. Bimonthly progress rept. no. 18, app. 1 on Contract N6onr-240, T.O.1. 25 July 51, 46p. ATI-208 085.
Order from LC mi$3.30, ph$7.80 PB 143 876

Contents:
The general concept of usage factors - critical notes
Usage factors and operations parameters - an example
Determination of a safety allowance
A hypothetical special purpose computer for procurement control problems
Extracts from a cost analysis of various tankers

Rome Air Development Center, Griffiss AFB, N. Y.
ORTHOGONAL FUNCTIONS AS SIGNAL ELEMENTS, by Alfred Kobos. Jan 59, 17p. 5 refs. RADC-TN-58-363; AD-206 256.
Order from LC mi$2.40, ph$3.30 PB 139 089

The use of orthogonal elements for transmitting digital data with a coherent-type system is illustrated, using a set of Gaussian pulses as an example. This technique is shown to be theoretically capable of providing a great increase in signaling speed. The necessary requirements of such a system are discussed, outlining future work which must be accomplished.

MECHANICS

Brown U. Div of Applied Mathematics, Providence, R. I.
THE BURSTING SPEED OF A ROTATING PLASTIC DISC OF VARIABLE THICKNESS, by Marie Madden Smith. Technical rept. no. 35 on Contract Nonr-562(10). Apr 58, 25p. 10 refs. C11-35.
Order from LC mi$2.70, ph$4.80 PB 139 258

This paper presents a method for determining the bursting speed of a thin rotating disc of varying thickness made of a strain-hardening material. The method is based on Tresca's yield condition and flow law and neglects all elastic strains.

Brown U. Div. of Applied Mathematics, Providence, R. I.
LIMIT ANALYSIS OF CYLINDRICAL SHELLS USING APPROXIMATE YIELD CONDITIONS, by H. Cohen and R. T. Shield. Technical rept. no. 2 for Mar 58 on Basic Research in Analysis and Design of Shells, Contract DA 19-020-ORD-4564. Apr 58, 32p. 10 refs. Rept. DA-4564/2; AD-137 082.
Order from LC mi$3.00, ph$6.30 PB 143 868

The theorems of limit analysis are used to obtain close bounds for the limit loading in some problems of symmetrically loaded cylindrical shells. It is shown that a parabolic prism approximation to the exact yield surface is a more useful approximation than the sandwich shell polyhedron surface when appreciable axial force is present.

Fritz Engineering Lab., Lehigh U., Bethlehem, Pa.
BUCKLING OF UNIFORMLY COMPRESSED STEEL PLATES IN THE STRAIN-HARDENING RANGE, by Geerhard Haaijer. Progress rept. no. 20 on Welded Continuous Frames and Their Components, Contract [N7onr]-39303. Aug 56, 66p. 20 refs. Fritz Lab. rept. no. 205E.7.
Order from LC mi$3.90, ph$10.80 PB 130 015

The problem of buckling of steel plates compressed beyond the yield strain is treated. General expressions for the buckling strength are derived assuming the material to have become orthogonally anisotropic.

Institute of Flight Structures, Columbia U., New York.
ON VIBRATIONS OF CYLINDRICAL SHELLS OF ELLIPTIC CROSS-SECTION, by G. Herrmann and I. Mirsky. Technical note no. 5 on Contract AF 18(600)1247. Dec 57, 24p. 3 refs. CU-17-57-AF-1247-CE; AFOSR-TN-57-734; AD-136 721.
Order from LC mi$2.70, ph$4.80 PB 138 602

Frequencies of free vibration of thin elastic cylindrical shells of constant thickness and elliptic cross-section are determined for several modes of motion. It is shown that purely longitudinal motions, for small ellipticities, are governed by a Mathieu equation and that the square of the frequency of a slightly elliptic shell with semi-axes a and b is the arithmetic mean of the squares of the frequencies of 2 circular shells with radii a and b, respectively. Purely torsional motion appears to be uneffected by ellipticity, while purely transverse motion (breathing mode) does not exist in elliptic cylinders. Flexural motions are studied by energy methods. It is found that in the absence of nodal lines parallel to the generator, the ellipticity increases the frequency considerably for shells of like cross-sectional area. If cylindrical shells of like circumference, that is of like mass, are compared with one another, the influence of ellipticity is stronger.

Michigan U. [Research Inst.] Ann Arbor.
ON THE INFINITE ELASTIC, PERFECTLY PLASTIC WEDGE UNDER UNIFORM SURFACE TRACTIONS, by S. A. Murch and P. M. Naghdi. Technical rept. no. 11 on Contract Nonr-1224(01). Jan 58, 23p. 9 refs. 2150-11-T; AD-161 937.
Order from LC mi$2.70, ph$4.80 PB 138 250

This paper is concerned with both plane strain and plane stress solutions of the infinite elastic, perfectly plastic wedge (of included angle $0 < \beta < 2$) under uniform surface tractions, where Tresca's yield condition and its associated flow rules are employed. Following a detailed examination of the character of the initial yield, attention is confined to the class of problems where yielding occurs externally on one or both boundaries. Specifically, complete solutions are obtained for a wedge under uniform shear on one face in both states of plane strain and plane stress, in the light of which the symmetry of the stress tensor is also discussed.

Minnesota U., Minneapolis.
FATIGUE CRACK DETECTION METHODS. PART 2: REVIEW OF EXPERIMENTAL DATA ON THE INITIATION AND PROPAGATION OF FATIGUE CRACKS IN TEST SPECIMENS, by L. J. Demer. Rept. for Jan-Mar 55 on Materials Analysis and Evaluation Techniques, Contract AF 33(038)20840. June 55, 77p. 45 refs. WADC-TR-55-86, pt. 2; AD-75 478.
Order from LC mi$4.50, ph$12.30 PB 143 877

Current fatigue literature contains numerous references to a few recent studies in which fatigue cracks have been detected very early in the specimen life. This paper attempts to clarify such isolated observations by making a detailed review of the available experimental data in relation to crack initiation and growth in laboratory fatigue test specimens. The data are analyzed considering the nature of the test material, the character of the specimen, the stress level of the test, and the manner of testing.

Missouri U. Engineering Experiment Station, Columbia.
BASIC RESEARCH IN FORCE RELAXATION METHODS, by Adrian Pauw. Final technical rept. on Contracts DA 23-072-ORD-(818, 1050). June 58, 173p. 5 refs. AD-200 756.
Order from LC mi$8.10, ph$27.30 PB 143 259

Part 1. Solution of linear simultaneous equations by pivotal and stepped group-operator relaxation
Part 2. Solution of hinged space frames by the method of bar-force relaxation
Part 3. The use of pivotal and stepped-block relaxation patterns in the solution of difference and partial-difference equations
Part 4. Solution of polynomial equations

Polytechnic Inst. of Brooklyn, N. Y.
APPLICATIONS OF A CONSISTENT THEORY FOR STRAIN HARDENING PLASTIC SOLIDS, by Nicholas Perrone and P. G. Hodge, Jr. Rept. on Contract Nonr-839(11). Oct 57, 120p. 19 refs. PIBAL rept. 403.
Order from LC mi$6.00, ph$18.30 PB 138 857

A critical analysis of a kinematic model for hardening first suggested by Prager is given. Specific applications to the flexure of non-symmetric sandwich beams, the bending of circular and annular plates, and the axisymmetric loading of circular cylindrical shells are made.

Aerodynamics and Pneumatics

Arnold Engineering Development Center [Tullahoma, Tenn.]
A SMALL-SCALE FORCED-OSCILLATION DYNAMIC BALANCE SYSTEM, by C. J. Welsh and P. L. Clemens. Rept. on ARO, Inc. Contract AF 40(600)700 Sup. 6(58-1). June 58, 17p. 6 refs. AEDC-TN-58-12; AD-157 143.
Order from LC mi$2.40, ph$3.30 PB 143 274

A small-scale, forced-oscillation dynamic balance for measuring damping derivatives of models with one degree of freedom is described. Results of measurements of $C_{m_q} + C_{m_{\dot{\alpha}}}$ for a clipped-delta-wing-body configuration over a range of Mach numbers of 2.0 to 5.0 are given. The measurements are shown to be consistent and to follow the trend with Mach number as predicted by theory.

Cornell Aeronatuical Lab., Inc., Buffalo, N. Y.
RESEARCH ON ROTATING STALL IN AXIAL FLOW COMPRESSORS. PART II. ON THE SEPARATION OF THE UNSTEADY LAMINAR BOUNDARY LAYER, by R. A. Hartunian and F. K. Moore. Rept. on Contract AF 33(616)3558. Jan 59, 33p. 14 refs. WADC Technical rept. 59-75, Pt. 2; AD-216 302.
Order from OTS $1.00 PB 161 072

A theoretical study is made of the unsteady but nearly quasi-steady laminar incompressible boundary layer near separation. It is shown that near separation on an airfoil, say, the general problem divides into (1) a problem of unsteady perturbation with a separation point which, in the quasi-steady approximation, is fixed with respect to the wall and (2) a steady problem related to that of a moving wall. The singularity near separation is analyzed for the unsteady and moving-wall cases. It is concluded that in the former case, the separation criterion of vanishing wall shear applies, and in the latter case (and in general) separation occurs whenever shear and velocity simultaneously vanish. The Falkner-Skan analysis is extended to apply to the two fundamental problems. In the unsteady case a shift of separation point is calculated. In the moving-wall case, the point of zero shear, the point of maximum adverse pressure gradient, and the point of simultaneously zero velocity and shear are noted. The implications of the results of this study regarding the complete generality of the separation criterion cited above, as well as the potentialities of application of the results in the formulation of an approximate method for unsteady boundary-layer calculation, are discussed. (See also PB 151 948)

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
INVESTIGATION OF TRANSITION CAUSED BY THE STOPPING OF A FLAT PLATE, by John C. Hegarty. Rept. on Contract AF 18(600)1014. June 58, 38p. 8 refs. Technical note BN-141; AFOSR TN-58-627; AD-162 157.
Order from LC mi$3.00, ph$6.30 PB 138 871

The present paper investigates the amplification of the small perturbation due to boundary-layer instability into discrete vortex lines and their subsequent distortion into a three-dimensional pattern. The intensification of the vortices and the three-dimensional distortion is believed to be a necessary step of the phenomena of transition from laminar to turbulent flow. The investigation was initiated because of criticism against the use of a trip wire as a means of promoting the process of amplification of the small perturbation. The results in many respects are in accord with those obtained from the trip wire.

Massachusetts Inst. of Tech., Cambridge, Mass.
INTRODUCTORY STUDY OF FLUTTER OF LOW-ASPECT-RATIO WINGS AT SUBSONIC SPEEDS, by Herbert M. Voss and Hermann J. Hassig. Rept. on Aero-Elastic and Structures Research, Contract NOas-51-109-c. 1 May 52, 103p. 36 refs. AD-144 729.
Order from LC mi$5.70, ph$16.80 PB 143 568

Acceleration potential methods and their application to the circular wing are reviewed. The flutter analysis and forced vibration of wings with circular and elliptical plan forms are outlined, pointed toward the design of an experimental model. An improved theory for low-aspect-ratio rectangular wings is given as well as an extension of low-aspect theory to include unsteady flow. The compressibility correction in subsonic flow is also considered.

Massachusetts Inst. of Tech., Cambridge.
ON SIMPLE WAVES IN PERFECT AND DISSOCIATING GASES: THEORY AND APPLICATIONS, by Haim Kennet. Rept. on Contract AF 18(600)961. Feb 58, 62p. 16 refs. Fluid Dynamics Research Group rept. 58-1; OSR Technical note no. 58-302; AD-154 212.
Order from LC mi$3.90, ph$10.80 PB 143 511

A theoretical method is developed for estimating aerodynamic loads on oscillating airfoils in dissociating flow, when the flow is in dissociative equilibrium. This procedure is based on a method of solution originally prepared by Lighthill for the case of a perfect fluid.

Michigan U. Research Inst., Ann Arbor.
THE DIFFRACTION OF SHOCK WAVES THROUGH OBSTACLES WITH VARIOUS OPENINGS IN THEIR FRONT AND BACK SURFACES, by Russell E. Duff and Robert N. Hollyer, Jr. Rept. on Contract N6onr-232, T. O. 4. 7 Nov 50, 57p. 3 refs. Rept. 50-3; ATI-94 435.
Order from LC mi$3.60, ph$9.30 PB 143 646

This report presents the results of a photographic investigation of shock-wave diffraction through models with various openings in their front and back surfaces. Also included is a discussion of a method for determining the strength of shock waves by measurements of limiting Mach configurations.

National Research Labs., Ottawa (Canada).
ORGANIZATION OF A LARGE COMPUTATION IN AIRCRAFT STRESS ANALYSIS, by A. L. M. Grzedzielski. July 59, 49p. 16 refs. Aeronautical rept. LR-257.
Order from LC mi$3.30, ph$7.80 PB 143 577

Theoretical and organizational aspects of a large scale numerical stress analysis covering effects of applied loads and uneven temperature are discussed, using the example of a swept multi-spar model box for which experimental data are available. A large scale computation, actually performed during the design of a prototype aircraft, is described.

Naval Ordnance Lab., White Oak, Md.
TIME LAGS DUE TO COMPRESSIBLE-POISEUILLE FLOW RESISTANCE IN PRESSURE-MEASURING SYSTEMS, by J. M. Kendall. 2 May 50, 38p. 16 refs. Memo. no. 10677.
Order from LC mi$3.00, ph$6.30 PB 143 867

In the development of the aerodynamic features of a missile in the supersonic wind tunnel, many pressure measurements must be made. It is frequently found that the response time of the pressure-measuring systems is too great, especially when the measurements are made in an intermittent supersonic wind tunnel. The time response of pressure-measuring systems is basically analyzed in this report for the case where compressibility and viscosity are predominating factors.

Naval Supersonic Lab., Mass. Inst. of Tech., Cambridge.
A SUMMARY OF EXPERIMENTS WITH SLOTTED TRANSONIC INSERTS IN THE NAVAL SUPERSONIC WIND TUNNEL, by Eugene E. Covert. Apr 58, 77p 25 refs. Technical rept. 207.
Order from LC mi$4.50, ph$12.30 PB 143 871

The calibration of the transonic nozzle blocks for the Naval Supersonic Laboratory Wind Tunnel indicates that the useful Mach number range is between 0.5 and 1.30 and that the distribution is relatively uniform. These results were obtained with a calibration pole and are expected to hold for all bodies of revolution of length twelve inches or less and winged bodies whose span is eight inches or less. The measurements indicate that for bodies with a blocking area up to one and one half percent of the tunnel area, the slots deblock as expected by the theory. Further, models with a length of two-thirds of the tunnel height or less, and whose span is forty-five percent of the tunnel height or less, may be tested on a development basis, provided a suitable correction is made for a flow inclination. Some auxiliary results are given which help explain the phenomena encountered in slotted tunnels.

Ohio State U. Research Foundation, Columbus.
CRITICAL PERFORMANCE PARAMETERS OF AN INTERMITTENT HIGH-PRESSURE FREE-JET SUPERSONIC WIND TUNNEL, by J. D. Lee and G. L. Von Eschen. Final rept. on Contract W33-038-ac-21683. 31 July 54, 117p. 12 refs. AD-46 137.
Order from LC mi$6.00, ph$18.30 PB 143 498

The flows from the nozzles of the free-jet, supersonic wind tunnel were calibrated. The performance of the wind tunnel while operating with long free jets was satisfactory. The internal growth of the viscous boundary was not excessive at any Mach number so that a core of usable size is available for testing with a second test region. No difficulty was experienced in starting the tunnel with free jets of the maximum length. The operation of the tunnel was theoretically analyzed by a 1-dimensional injector theory, and the results compared favorably with experimental measurements. The use of an adjustable diffuser resulted in very small changes in the operating efficiency of the tunnel. The optimum diffuser shape was deduced to be a constant-area duct followed by a diverging (subsonic) diffuser section. The only useful function of the adjustable diffuser appeared to be that of controlling the ratio of the test chamber pressure to the nozzle exit pressure. The components of the air supply and control system were judged to be satisfactory. Oscillograph records show that the control system allows the stagnation pressure to be held generally within less than 1% of a preselected value over the period of the test.

Polytechnic Inst. of Brooklyn, N. Y.
SOME HEAT TRANSFER PROBLEMS IN HYPERSONIC FLOW, by Antonio Ferri. Rept. on Contract AF 49(638)445. July 59, 61p. 13 refs. PIBAL rept. no. 473; AFOSR-TN-59-806.
Order from LC mi$3.90, ph$10.80 PB 143 600

The curved shock waves associated with blunt bodies at hypersonic velocity produce large entropy gradients and therefore large shear flows which interact with the boundary layer. In this paper the effects of this shear flow are discussed for the case of axially symmetric and two-dimensional flow fields and for low and high Reynolds number of flight. Approximate methods of heat transfer analysis are presented for the case of laminar boundary layer in the presence of a shear flow with a cold wall and in the case of zero pressure gradient. Results of an experimental investigation on the effects of interaction between external flow and laminar turbulent heat transfer and/or the effect of shear flow on transition are also presented. The experimental results show that these are large effects and important for practical applications.

Polytechnic Inst. of Brooklyn, N. Y.
THE THREE-DIMENSIONAL COMPRESSIBLE LAMINAR BOUNDARY LAYER, by Melvin Epstein. Rept. on Contract AF 49(638)217. Oct 58, 84p. 30 refs. PIBAL rept. no. 455; AFOSR-TN-58-894; AD-204 135.
Order from LC mi$4.80, ph$13.80 PB 143 510

A method is presented for determining approximate solutions to the three-dimensional compressible laminar boundary layer equations. The proposed method resembles the classical integral method in certain respects. It is designed, however, to overcome one of the principal difficulties associated with integral method, namely the problem of choosing appropriate analytical representations of the boundary layer profiles. This difficulty is magnified in the three-dimensional problem where an additional profile must be specified. In such cases it is desirable that a means of automatically choosing a set of profiles, which are appropriate to the problem at hand, be available. This is accomplished, in the present method, by means of an iteration procedure wherein improved approximations to the boundary layer profiles are generated from a set of simple initial profiles.

Technische Hochschule, Munich (West Germany).
THE NUMERICAL SOLUTION OF BOUNDARY-VALUE PROBLEMS FOR CERTAIN HYPERBOLIC LINEAR DIFFERENTIAL EQUATIONS, by Hans J. Stetter. Technical note no. 7 on Contract AF 61(514)1080. 24 Apr 59, 38p. 10 refs. AFOSR-TN-59-673; AD-218 385.
Order from LC mi$3.00, ph$6.30 PB 143 164

A detailed investigation is given of procedures yielding a numerical solution of certain boundary-value problems of a linear partial differential equation related to the wave equation. After the statement of the problem and the presentation of some analytic results the characteristic system of the equation is transcribed into a system of difference equations in a characteristic grid, using an ADAMS-interpolation difference scheme. It is shown how these difference equations may be conveniently solved in each point of the grid. A method is presented to take care of discontinuities in the boundary data. The numerical procedures necessary to get the computations on the difference equations started are also described.

Applied Mathematics and Statistics Lab., Stanford U., Calif.
SCATTERING OF SURFACE WAVES ON AN IDEAL FLUID, by Harold Levine and Eugene Rodemich. Technical rept. no. 78 on Contract Nonr-225(11). 14 Oct 58, 65p. 10 refs.
Order from LC mi$3.90, ph$10.80 PB 143 336

California U., Los Angeles.
AN EXPERIMENTAL STUDY OF ACOUSTICALLY INDUCED CAVITATION, by William J. Galloway. Technical rept. no. 7 on Contract N6onr-275(07). Nov. 53, 62p. 27 refs.
Order from LC mi$3.90, ph$10.80 PB 143 218

California U., Los Angeles.
STUDY OF ACOUSTIC STREAMING, by Herman Medwin. Technical rept. no. 8 on Contract N6onr-275(07). Dec 53, 68p. 20 refs.
Order from LC mi$3.90, ph$10.80 PB 143 214

David Taylor Model Basin, Washington, D. C.
MOTION OF RIGID AND FLUID SPHERES IN STATIONARY AND MOVING LIQUIDS INSIDE CYLINDRICAL TUBES, by W. L. Haberman and R. M. Sayre. Oct 58, 68p. 30 refs. Rept. no. 1143.
Order from LC mi$3.90, ph$10.80 PB 138 641

This report considers the problem of steady, axial translation of rigid and fluid spheres in stationary and moving viscous, incompressible fluids bounded by an infinitely long cylinder. The investigation is based on Stokes' approximation for the hydrodynamic equations for slow flow. An exact and an approximate solution for the motion of rigid spheres are obtained. For fluid spheres (consisting of a fluid of different physical property than the external medium and having internal motion) an approximate solution is obtained. In general, the results show that the wall effect for fluid spheres is less than for corresponding rigid spheres. Streamlines and velocity distributions for several cases where the diameter ratio is 0.5 are compared with those in an infinite medium.

METALLURGY

Battelle Memorial Inst., Columbus, Ohio.
THE DEVELOPMENT OF CHROMIUM-BASE HEAT-RESISTANT ALLOYS, by J. M. Blocher, Jr., I. E. Campbell and others. Rept. on Contract AF 33(616)48. Jan 54, 170p. 30 refs. WADC Technical rept. 53-470; AD-31 248.
Order from LC mi$7.80, ph$25.80 PB 143 650

A study was made of the mechanical properties of high-purity Cr prepared by the thermal decomposition of CrI_2. Modification of the iodide-decomposition process led to the preparation of Cr containing less than 150 ppm of total impurities. A rough correlation of as-deposited iodide Cr hardness with total metallic-impurity content was obtained which shows a minimum hardness in the range of 500 to 1000 ppm. Chromium sheet, suitable for testing in bending, was made by arc melting iodide Cr and rolling the resultant ingots at 700°C. Rolling in air without sheathing or other special precautions produced sheet free of cracks. Many samples showed bend ductility at -25°C, although brittle failure occurred in all room-temperature tensile tests. Additions of controlled amounts of impurities were made to determine the compositional factors affecting the room-temperature ductility of Cr. The elements most detrimental were Ni (above 0.2%), and C and S (each in quantities over 0.015%). Fe and Si were not especially harmful up to about 0.2%. Variations in O content from about 60 to 3000 ppm had no effect on the bend ductility. Sheet for bend testing with less than 60 ppm of O could not be obtained without additions of C. It is possible that a sharp increase in ductility occurs at a lower O concentration, as is the case for Mo. Ni had little effect on the bend ductility in quantities above the lowest attained (10 ppm).

Fansteel Metallurgical Corp., North Chicago, Ill.
INFORMAL MONTHLY PROGRESS REPORT TO NEPA PROJECT [FOR OCTOBER 21-NOVEMBER 20, 1948] by Ralph Wehrmann. 23 Nov 48, 10p. NEPA 831-FAN-17; AD-203 994.
Order from LC mi$1,80, ph$1.80 PB 138 318

(See also PB 138 315)

Massachusetts Inst. of Tech., Cambridge.
PERIODIC STATUS REPORT NO. 25, by L. Rubin, M. Yim and others. Rept. for 1 Aug-31 Oct 58 on Contract Nonr-1841(28). [1958] 3p.
Order from LC mi$1.80, ph$1.80 PB 143 222

Contents:
Solid solution strengthening
Ductility-and-creep-rupture properties of nickel
Resistivity changes during creep of aluminum alloy
An investigation of high temperature behavior of austenitic stainless steels
(See also PB 140 626)

Naval Ordnance Plant, Indianapolis, Ind.
IMPROVING VANASIL HIGH SILICON ALUMINUM ALLOY BY PHOSPHOR COPPER MODIFICATION, by J. C. Wagner. 16 Feb 55, 24p. 10 refs. Materials rept. no. 40.
Order from LC mi$2.70, ph$4.80 PB 143 893

The addition of a small amount of dilute phosphor copper to Vanasil exerts a powerful influence in reducing silicon particle size and segregation. Modification by phosphor copper offers several advantages as contrasted to modification by sodium or sodium salts. The advantages are: reliability and ease of control, ability to be effective throughout the duration of a melt held molten at least two and one half hours, and ability to be effective when the alloy is remelted.

Research Inst., Temple U., Philadelphia, Pa.
HIGH TEMPERATURE PROJECT, by A. V. Grosse and J. B. Conway. Progress rept. no. 6, 1 Jan-1 July 52, on Contract N9onr-87301. 1 July 52, 16p. 1 ref. AD-135 203.
Order from LC mi$2.40, ph$3.30 PB 143 758

The studies concerned with the operation of powdered metal-oxygen torches, have been extended to various other powdered metals and alloys as follows: Aluminum, Magnesium, Manganese, Silicon, Calcium Carbide, Silicon Carbide, Calcium-Silicon, Zirconium-Silicon and Aluminum-Silicon. (See also PB 132 012)

Watertown Arsenal Labs., Mass.
HOT HARDNESS AND TENSILE PROPERTIES OF STAINLESS STEEL TYPE 304, TITANIUM ALLOY Ti-150A, AND SAE 4140 STEEL AT 300° AND 600°F, by Anthony K. Wong and George Gazza. July 59, 36p. 19 refs. Technical rept. no. WAL TR 116/2.
Order from LC mi$3.00, ph$6.30 PB 142 893

Hardness tests were made in modified Rockwell and Brinell machines equipped with a resistance-heated furnace. Tensile tests were conducted at strain rates of 0.1 and 0.5 inch per second. Tensile specimens were rapidly heated by an induction coil and held at temperature for one minute prior to application of load.

Watertown Arsenal Labs., Mass.
HOT-PRESSED AND ROLL-REDUCED COMPACTS OF ALLOY Ti-6%Al-4%V POWDER RECOVERED FROM WROUGHT METAL SCRAP, by S. V. Arnold. June 59, 25p. WAL TR-405.7/1; AD-217 828.
Order from LC mi$2.70, ph$4.80 PB 143 665

Massive scrap of alloy Ti-6%Al-4%V was embrittled with hydrogen and comminuted to powder of metallurgical quality. Compacts of this powder, hot-pressed to theoretical density approximated the original composition but showed equivalent strength and somewhat lower ductility. Compacts hot-roll-reduced developed higher strengths and ductility than the commercial mill-annealed wrought metal.

Ferrous Metals

Douglas Aircraft Co., Inc. [El Segundo, Calif.]
THE INFLUENCE OF EXTRANEOUS ELEMENTS IN D. C. ARC SPECTRA OF FERROUS ALLOYS, by Darwin P. Jensen and J. F. Young. Rept. on Emission Spectroanalytical Procedures, Contract AF 33(038) AF 33(038)23304. July 52, 42p. 15 refs. WADC Technical rept. 52-168; ATI-173 043.
Order from LC mi$3.30, ph$7.80 PB 139 068

The influence of one alloying element upon the spectral line intensity of any other alloying element was subjected to investigation in the D. C. Arc. The study was carried out by making homogeneous metallic alloys in an induction furnace. Manganese, silicon, nickel, chromium, molybdenum, vanadium, aluminum and copper were used as the alloying elements in an iron matrix, with percentage magnitudes commonly found in low alloy steels.

Illinois U., Urbana.
INVESTIGATION OF THE CRYSTALLOGRAPHY OF DIFFUSIONLESS PHASE CHANGES IN STEEL, by C. M. Wayman. Summary rept. on Contract AF 18(600)1311. 31 Aug 58, 10p. 13 refs. Rept. 20-AF; AFOSR [TR]-58-121; AD-202 922.
Order from LC mi$1.80, ph$1.80 PB 138 654

A summary of previous publications by technical societies by the authors on martensitic types of phase transformations in metals.

Metals Research Lab., Case Inst. of Tech., Cleveland, Ohio.
INVESTIGATION OF SIGNIFICANT PROPERTIES AND CHARACTERISTICS OF COLD WORKED STEEL. Technical rept. no. 2 on Contract W33-019-ORD-6339. 31 Aug 48, 46p. 29 refs. WAL rept. no. 310/90-8.
Order from LC mi$3.30, ph$7.80 PB 143 760

The change in the mechanical properties upon cold working forms a general curve for all steels. The rate of change is high from 0 to 20 per cent reduction, levels off for reductions from 20 to 60 per cent and increases again for reductions above 60 per cent. The variables such as carbon content and heat treatment before cold working seem to have little affect upon the rate of change of properties. The effect of these variables is merely to displace the properties after cold working by an amount which is consistant with the changes before cold working.

Metals Research Lab., Case Inst. of Tech., Cleveland, Ohio.
INVESTIGATION OF SIGNIFICANT PROPERTIES AND CHARACTERISTICS OF COLD WORKED STEEL: A COMPARISON OF THE MECHANICAL PROPERTIES OF COLD DRAWN STEEL BARS WITH A HEAT TREATED 4410 STEEL BAR. Technical rept. no. 23 on Contract DA 33-019-ORD-585. Jan 53, 17p. WAL rept. no. 310/90-80.
Order from LC mi$2.40, ph$3.30 PB 143 759

The 4140 steel heat treated to a tensile strength of 132,000 psi showed very high ductility, high impact energy, low transition temperature, was notch insensitive and was only slightly anisotropic. As compared to the cold worked steels, the heat treated steel showed higher mechanical properties in all the tests made in this investigation (i.e., longitudinal and transverse tensile, V-notched Charpy impact, and notched tensile tests). (See also PB 143 760)

Naval Weapons Plant, Washington, D. C.
INVESTIGATION OF THE EFFECT OF HYDROGEN EMBRITTLEMENT AND ITS RELIEF IN PHOSPHATE COATED AISI 4340 AND 1095 STEELS, by

P. H. Austin, S. V. Chek and Wm. Lurie.
12 Aug 59, 33p. 5 refs. NWPW-T-20-59; NAVORD rept. no. 6509.
Order from LC mi$3.00, ph$6.30 PB 143 424

The effect of hydrogen embrittlement resulting from the phosphate coating of AISI 4340 and 1095 steels, at various hardness levels, was investigated by the use of sustained load (ring) tests made at 80% of the uncoated notch breaking strength of the steels for corresponding hardnesses.

Nonferrous (except light) Metals

Armour Research Foundation, Chicago, Ill.
MEASUREMENT OF THE HEAT CAPACITY AND DENSITY OF LIQUID COPPER, by J. I. Lang. Rept. for 1 July 56-30 June 57 on Contract AF 33(616)3795. Nov 57, 23p. 1 ref. WADC Technical rept. 57-488; AD-142 138.
Order from LC mi$2.70, ph$4.80 PB 143 647

The density and specific heat of molten electrolytic tough-pitch copper meeting Federal Specification QQ-C-576 was determined for the temperature range 2000 to 4000°F.

Illinois Inst. of Tech., Chicago.
A STUDY OF ORDER IN Au_3Cu, by Francois d'Heurle (Doctoral thesis) and Paul Gordon. Technical rept. no. 2 on Contract Nonr-1406(03). Oct 58, 104p. 53 refs.
Order from LC mi$5.70, ph$16.80 PB 143 246

Isothermal jacket microcalorimeters have been built to study the evolution of small quantities of heat occurring over long periods of time at low temperature. The calorimeters have been used for the study of the order-disorder transformation of Au_3Cu. The critical temperature is 209-2°C. The total enthalpy change between a completely ordered and a completely disordered sample is estimated to be 375 calories per mole. At 100°C, in a quenched sample the rates of ordering can be more than a thousand times greater than would be calculated on the basis of the rates observed at 190°C.

New York U., N. Y.
RADIOTRACER STUDIES OF METAL - METAL ION EXCHANGE. I. CADMIUM, by Cecil V. King and Robert Skomorski. Technical rept. no. 1 on Contract DA 30-069-ORD-1682. Feb 58, 31p. 21 refs. AD-154 799.
Order from LC mi$3.00, ph$6.30 PB 143 453

The rate and extent of exchange between cadmium and its own ions in solutions of cadmium perchlorate has been studied by using radioactive Cd^{115} as a tracer. It was not found possible to measure the "exchange current" i_0, which would represent the actual rate of exchange at the metal surface. Instead, surface equilibrium appears to be reached within a few minutes, and the continuing pickup of activity to be controlled by grain-boundary diffusion within the metal. By comparison with lattice diffusion coefficients in the literature by the method of Fisher, grain boundary diffusion coefficients have been estimated from experiments at room temperature and at 98°C.

Structural Metallurgy and Corrosion

Armour Research Foundation, Chicago, Ill.
A STUDY OF HIGH TENSILE BRASSES. Final rept. for 20 Apr 56-28 Feb 58 on Contract NObs-72136. 31 Mar 58, 89p. 13 refs. AD-162 371.
Order from LC mi$4.80, ph$15.30 PB 143 937

Effects of composition, constitution, and past history on the fracture characteristics (particularly stress-corrosion susceptibility) of two high tensile brasses (manganese bronzes). Stress-corrosion and stress-rupture tests in 3% salt water were run. In the base wrought alloy (46B15e) the only cases where stress corrosion susceptibility was observed were those where only β phase was present. The casting alloy (SAE 430B) and its compositional modifications were sensitive to stress-corrosion cracking. This susceptibility is enhanced as the zinc content is increased or as the processing temperature is raised.

Bureau of Ships, Washington, D. C.
STATISTICAL PLAN FOR THE EXPERIMENT ON CORROSION BY H_2O AND O_2 IN ISOPROPYL BIPHENYL, by A. Lieberman. 16 Oct 56, 8p. 3 refs. Rept. no. 310B-28R1; AD-144 980.
Order from LC mi$1.80, ph$1.80 PB 138 630

To determine if corrosion of fuel cladding materials is accelerated by H_2O and O_2 in isopropyl biphenyl.

Columbia U., New York.
EFFECTS OF GASEOUS AND LIQUID ENVIRONMENTS ON THE BRITTLE FRACTURE OF ZINC SINGLE CRYSTALS, by L. C. Weiner. Rept. on Contract AF 18(600)898. 29 Aug 57, 7p. 20 refs. AFOSR-TN-57-553; AD-136 537.
Order from LC mi$1.80, ph$1.80 PB 130 241

The effects were studied of solid environments on the brittle fracture of Zn single crystals. Results are given of gaseous and liquid environments on cleavage strength. N, H, He, and CO_2 did not react with the Zn crystals to produce a surface coating and did not effect σ_F, the normal fracture stress. HCl and H_2S reacted to form a uniform, adherent surface layer of $ZnCl_2$ and ZnS, respectively. The films were of sufficient thickness to cause an increase in σ_F of the same order of magnitude as that of initially coated specimens. An O atmosphere increased σ_F similar to that noted with coated crystals, but no coating was visible. However, specimens treated in an O atmosphere and subsequently etched in dilute HNO_3 gave a value of σ_{FM} (mean value) of 2475 psi. A ZNO surface film of sufficient thickness was formed to cause this large increase in σ_F. A gaseous or liquid environment will only increase the cleavage strength of initially clean Zn single crystals, when the medium

reacts to form an adherent surface film of a thickness greater than a few hundred angstroms.

Container Labs., Inc., Washington, D. C.
EVALUATION OF VOLATILE CORROSION INHIBITORS FOR PRESERVATION AND PACKAGING. PART I. LITERATURE SURVEY AND PRELIMINARY INVESTIGATION, by Gordon S. Mustin. Rept. on Contract DA 18-108-CML-6424. 20 Jan 58, 87p. 216 refs. Rept. no. 9927.
Order from LC mi$4.80, ph$13.80 PB 143 295

The objective of this Part I study is to assemble, review, and evaluate published literature and military agency reports, as well as current work in progress, as available, with a view to determining additional investigations required to evaluate specific applications to Chemical Corps equipment.

Defense Metals Information Center, Battelle Memorial Information Center, Columbus, Ohio.
TITANIUM ALLOYS FOR HIGH-TEMPERATURE USE STRENGTHENED BY FIBERS OR DISPERSED PARTICLES, by J. W. Holladay. Rept. on Contract AF 18(600)1375. 31 Aug 59, 79p. 20 refs. Rept. 117.
Order from OTS $2.00 PB 151 073

Available data are reviewed on heterogeneous structures of titanium in which the titanium matrix is reinforced by a dispersion of metal fibers or particles. Fiber reinforcement offers promise for improving the shorttime strength and modulus of elasticity in the temperature range of 1000 to 1400 F. It has been demonstrated that titanium can be strengthened by dispersion hardening and by fiber reinforcement, although the best conditions have not yet been fully established.

Franklin Inst. Labs. for Research and Development, Philadelphia, Pa.
ETCH PATTERNS IN ZINC, by Victor V. Damiano and Marvin Herman. Interim rept. on Contract AF 18(600)1581. July 59, 24p. 4 refs. Rept. no. I-A1878-3; AFOSR-TN-59-133; AD-210 861.
Order from LC mi$2.70, ph$4.80 PB 143 674

Loops and spiral etch patterns were observed on surfaces parallel or nearly parallel to the basal plane of zinc. These observations have been tentatively interpreted as the dissolution of a step in the surface with the end of the steps pinned.

Michigan U. [Research Inst.] Ann Arbor.
DEVELOPMENT OF APPARATUS AND METHODS FOR MEASUREMENT OF CREEP AT TEMPERATURES TO 3500°F, by M. J. Sinnott. Progress rept. no. 4. Nov 1948, 8p. NEPA 846-MIC-4; AD-204 942.
Order from LC mi$1.80, ph$1.80 PB 138 947

Portions of this report are illegible.

Naval Engineering Experiment Station, Annapolis, Md.
EVALUATION OF CORROSION RESISTANCE OF CHROMIUM BASE ALLOYS TO HIGH TEMPERATURE GASES FROM RESIDUAL FUELS, by Henry W. Schab and Frank R. Gessner, Jr. 11 Feb 57, 42p. 1 ref. Research and development rept. 070312D.
Order from LC mi$3.30, ph$7.80 PB 143 873

The corrosion resistance of several chromium alloys to high temperature gases was determined by burning residual type fuels in small atmospheric combustors and full-scale pressurized gas turbine type combustors. Tests show that the corrosion attack on these alloys, by combustion products of the residual fuels burned to produce temperatures of 1600° and 1700°F, was less than that suffered by the base line material, AISI 310 (25% Cr - 20% Ni) alloy.

Naval Engineering Experiment Station, Annapolis, Md.
OIL-ASH CORROSION RESISTANCE OF THREE CHROMIUM-ALUMINUM-IRON ALLOYS, by W. B. Ennis. 9 Dec 57, 10p. 3 refs. Letter rept. no. 070312E.
Order from LC mi$1.80, ph$1.80 PB 143 874

The three alloys tested in the microburner rigs indicated good corrosion resistance to oil-ash products, when compared to the 310 alloy.

Naval Ordnance Lab., White Oak, Md.
TENSILE PROPERTIES OF MICROSHRINKAGE-GRADED AZ-63 MAGNESIUM ALLOY, by I. J. Feinberg and J. D. Grimsley. 11 Mar 58, 37p. 3 refs. NAVORD rept. 6074.
Order from LC mi$3.00, ph$6.30 PB 143 761

A determination of tensile properties related to the degree of the defect obtained in radiographic classification is described. Expected minimum properties for AZ-63 casting material containing six degrees of microshrinkage are presented.

Powder Metallurgy Lab., Rensselaer Polytechnic Inst., Troy, N. Y
CEMENTED CARBIDE COMPOSITION CONTAINING NON-STRATEGIC METALS AS BINDERS, by F. V. Lenel and M. F. Hoffman. Final rept. on Contract NObs-55219. June 54, 120p. 11 refs.
Order from LC mi$6.00, ph$18.30 PB 143 645

Cemented carbides of the compositions 90 WC - 10 Co, 90 WC - 10 Ni and 90 WC - 10 Fe were sintered (a) conventionally without the application of pressure during sintering, (b) by passing an electric current through the samples and simultaneously applying pressure. Cemented carbides of the compositions 82 WC - 8 TiC - 10 Co, 82 WC - 8 TiC - 10 Ni and 82 WC - 10 TiC - 10 Fe were resistance sintered under pressure. Cutting tool inserts were prepared from the resistance sintered carbide samples. Among the three compositions, the one with cobalt was superior to the one with iron, which in turn was superior to the one with nickel. The solubility of WC in nickel at 2400°F

appears to be 12% by weight; of WC in cobalt at 2375°F was more than 14 weight percent; of WC in an alloy of 60 percent iron 40% nickel at 2300°F as approximately 5 weight percent.

Rock Island Arsenal Lab., Ill.
THE EFFECT OF PROLONGED AND EXCESSIVE HEATING ON PETROLATUM RUST PREVENTIVES, by R. E. Johnson. Rept. no. 16 on Rust Preventives, Development of New Improved Test Methods. 15 Nov 51, 25p. 2 refs. RIA Lab. no. 51-4542.
Order from LC mi$2.70, ph$4.80 PB 143 869

Apparently prolonged and excessive heating does not have an appreciable effect on the protective properties of the Petrolatum Type Rust Preventives, as panels coated with the materials after heating passed the protection requirements of the specification as well as the original materials. A definite increase in acidity was noted throughout the heating period, however, any deleterious effects this may have had was not evident in the protective ability of the materials as far as accelerated tests were concerned.

Rock Island Arsenal Lab., Ill.
WATER DISPLACING RUST PREVENTIVES. III: WATER STABILITY, DILUTION AND DISPLACEMENT FROM RUSTED SURFACES, by D. Bootzin. Rept. no. 12 on Rust Preventives, Development of Improved Test Methods. 25 Jan 50, 47p. 4 refs. RIA Lab. no. 50-79.
Order from LC mi$3.30, ph$7.80 PB 143 870

A water stability test, employing unrusted panels, combining water displacement and water stability was developed and recommended to replace the current AXS-1759 water displacement test. Dilution of rust preventives proved important in determining the factor of safety provided by manufacturers in insuring water displacement action and as a reflection of the amount of additive used in their product. A dilution test was recommended to be incorporated in the next specification revision. The water displacement test recommended was found to be more selective than one employing rusted surfaces since poor or borderline materials could not be detected on rusted specimens. Water displacing rust preventives apparently displaced water and arrested further rusting dependent on the inherent protective characteristics of the compound.

Rutgers State U. Coll. of Engineering, New Brunswick, N. J.
ON THE MECHANISM OF RECRYSTALLIZATION OF ALUMINUM, by Sigmund Weissmann. Technical rept. no. 10 on Contract Nonr-404(09). Aug 58, 36p. 28 refs.
Order from LC mi$3.00, ph$6.30 PB 143 294

In 99.998% aluminum recrystallized grains were shown to be the product of preferential subgrain growth whereby subgrains subtending large disorientation angles with respect to their neighbors exhibited the highest velocity of growth.

NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

Harvard U., Cambridge, Mass.
THE HALF-LIFE OF THE METASTABLE LEVEL $A^3\Sigma$ OF THE NITROGEN MOLECULE, by O. Oldenberg. Final rept. for 1 Dec 55-31 Dec 56 on Contract Nonr-1866(08). 1 Oct 57, 10p. 2 refs.
Order from LC mi$1.80, ph$1.80 PB 138 901

Elementary Particles

Maryland U., College Park.
ON THE LEPTONIC DECAY MODES OF K-MESON, by K. Chadan and S. Oneda. Rept. on Contract AF 49(638)24. Aug 59, 11p. 12 refs. Physics Dept. Technical rept. no. 151; AFOSR-TN-59-877.
Order from LC mi$2.40, ph$3.30 PB 143 639

Michigan U. [Research Inst.] Ann Arbor.
NOTE ON THE PAIS-PICCIONI EXPERIMENT, by K. M. Case. Technical rept. on Contract Nonr-1224(15). Mar 56, 17p. 5 refs. 2457-1-T.
Order from LC mi$2.40, ph$3.30 PB 127 864

Two experiments to check the Gellmann-Pais "particle mixture" suggestion are analyzed, using a detailed, if crude, phenomenological description. A cloud-chamber experiment of the type proposed by Pais and Piccioni is compared to an experiment using a liquid-xenon bubble chamber. It is found that for likely values of the parameters involved, both experiments are considerably more difficult than envisaged by Pais and Piccioni. For intensity reasons, the bubble-chamber experiment seems preferable. However, unless quite accidentally the relevant cross sections have rather special values, it would seem that experiments of this type would have to wait until accelerators are available capable of producing considerably greater intensities than those in operation at present.

Instruments and Installations

Aeronautical Research Lab., Wright Air Development Center, Wright-Patterson AFB, Ohio.
DESIGN AND CONSTRUCTION OF A GASEOUS XENON PARTICLE DETECTOR, by Raymond H. Kelly. May 59, 17p. 7 refs. WADC Technical note 59-103; AD-216 088.
Order from OTS $0.50 PB 161 069

The techniques for building stable, demountable, gaseous xenon particle detectors are describe. The aspects of design, construction, and use which are most apt to be troublesome are considered in detail.

Spectra obtained with U^{235}, Po^{231}, and Po^{210} alpha sources (from detectors constructed by these techniques) are displayed.

National Bureau of Standards, Washington, D. C.
PHOTOGRAPHIC DOSIMETRY AT TOTAL EXPOSURE LEVELS BELOW 20 mr, by Margarete Ehrlich and William L. McLaughlin. Oct 59, 26p. Technical note 29.
Order from OTS $0.50 PB 151 388

Assemblies of commercial photographic material sandwiched between two plastic scintillators can be used to measure high-energy X- or gamma-ray exposures down to 1 mr and less. The energy dependence of the assemblies' response is much less than that of a conventional photographic dosimeter, in some instances allowing an exposure interpretation with an accuracy of ±25 percent over the energy range from about 0.1 Mev to 1.25 Mev. However, low-intensity reciprocity failure limits the range of applicability of the system. Conventional photographic dosimeters, not incorporating scintillators, are usually preferable for routine personnel dosimetry. By extending the monitoring period, it may be possible to avoid personnel dosimetry below 20 mr entirely. However, by doing this, one introduces additional difficulties because of instabilities in the photographic image. In some instances, an increase in effective emulsion thickness, achieved by using stacks of identical films, may lead to an increase in emulsion sensitivity sufficient to extend the useful range of a film badge well below 20 mr, without the use of a scintillator.

Quartermaster Research and Engineering Center, Natick, Mass.
GROUND ZERO LOCATORS, by J. D. Loconti, H. W. Coles, and C. D. Thron. 1 Nov 56, 16p. 2 refs. Research rept. High Polymer series no. 7.
Order from LC mi$2.40, ph$3.30 PB 139 015

One of the problems of defense in the event of atomic warfare is the accurate pinpointing of ground zero of an atomic explosion. Since atomic explosions cause destruction on such a vast scale in contrast to conventional explosives, it will not be readily apparent where a bomb has been dropped. The types of destruction surrounding zero point will vary with distance, and the type of rescue operations needed will depend upon the nature of the destruction. Thus a rapid determination of zero is critical to a well-planned fire fighting and rescue operation.

Nuclear Engineering and Power

Convair, Fort Worth, Tex.
CALIBRATION OF THE ASTR, by J. C. Nance. Rept. on Contract AF 33(600)32054. 1 Nov 57, 139p. 7 refs. NARF-57-48T; FZK-9-090.
Order from LC mi$6.90, ph$21.30 PB 143 872

The Aircraft Shield Test Reactor (ASTR) is a one megawatt Convair-built reactor designed primarily to provide a radiation source for airborne shielding studies related to the Aircraft Nuclear Propulsion project. This is a summary report on the early experiments performed with the ASTR. The purposes of the experiments were in general: (1) To assemble all reactor components into an operating system (minus fissionable material) and establish the operational integrity of the system prior to the critical experiment. (2) To perform the critical experiment and determine the controllability of the reactor under idealized conditions. (3) To establish (by a series of low power experiments) the important nuclear characteristics of the reactor and shield system. (4) To establish an absolute low power calibration of the reactor and associated instrumentation. (5) To determine (by the thermal calibration method) the linearity of reactor instrumentation at high powers as compared to low power calibration. Results of the above experiments have proven the adequacy of the reactor system from the standpoint of safety, operability, and reliability.

Naval Research Lab., Washington, D. C.
HEAT-TRANSFER STUDIES ON A FORCED CONVECTION LOOP WITH MONOISOPROPYLBIPHENYL, by J. P. Stone, C. T. Ewing and others. Final rept. 21 Nov 58, 16p. 9 refs. Rept. 5225.
Order from OTS $0.50 PB 151 159

Heat-transfer coefficients for monoisopropylbiphenyl, heated in a long horizontal tube under conditions of turbulent flow, are correlated to an average deviation of ±0.99 percent with an equation of the Dittus-Boelter type. Physical properties used in correlation work are presented. The coefficients extended from 463 to 3107 Btu/hr-ft^2-^{o}F for the following ranges of conditions: bulk-fluid temperatures, 240^o to 604^{o}F; heat-transfer surface temperatures, 312^o to 816^{o}F; heat fluxes, 44,800 to 308,000 Btu/hr-ft^2; Reynolds numbers, 18,500 to 350,000; fluid velocities, 5.7 to 36.4 ft/sec. In fouling experiments, no scaling of the heat-transfer surface of an organic type was observed at the extreme attainable conditions of 850^{o}F heat-transfer surface temperature and 5 ft/sec fluid velocity. The condition of the equipment after 2-1/2 years of service is discussed.

Vitro Corp. of America, New York.
CONCEPTUAL DESIGN OF 20 Mw NUCLEAR HEATING PLANT, by G. Caravella, R. Epstein and others. Rept. on Contract DA 44-009-eng-2861. 1 Nov 56, declassified 1 Oct 57. 209p. 33 refs. KLX-1769.
Order from LC mi$9.30, ph$31.80 PB 138 972

The conceptual design reported herein describes a nuclear power plant whose prime purpose is the indirect generation of steam for space heating and other low temperature applications. A pressurized water reactor with a core consisting of highly enriched uranium (UO_2) embedded in stainless steel has been selected for this application. The fuel plates consist of highly enriched UO_2 embedded in a matrix of stainless steel and clad with stainless steel.

Vitro Corp. of America, New York.
CONCEPTUAL DESIGN OF 20 Mw NUCLEAR HEATING PLANT: ADDENDUM AND ERRATA. Rept. on

Contract DA 44-009-eng-2861. 2 Jan 57, declassified 10 Oct 57, 10p. KLX-1769A.
Order from LC mi$1.80, ph$1.80 PB 138 972S

See also PB 138 972

Nuclear Reactions

Maryland U., College Park.
ON THE SUPPRESSION OF P-STATE CAPTURE IN (K^-, p) ATOMS, by T. B. Day, G. A. Snow, and J. Sucher. Rept. on Contracts AF 49(638)24 and AT(40-1)2504. June 59, 11p. 18 refs. Physics Dept. Technical rept. no. 137; AFOSR-TN-59-606; AD-217 393.
Order from LC mi$2.40, ph$3.30 PB 143 346

Nepa Div., Fairchild Engine and Airplane Corp., Oak Ridge, Tenn.
A DISCUSSION ON K EXCESS, by R. L. Echols. 30 Mar 48, 20p. NEPA 478-STR-1; AD-203 999.
Order from LC mi$2.40, ph$3.30 PB 138 316

Radioactivity

Army Medical Research Lab., Fort Knox, Ky.
OPTIMUM X-RAY YIELDS IN BETA-EXCITED X-RAY SOURCES, by J. G. Kereiakes, O. E. Weir, and A. T. Krebs. Rept. on Biological and Medical Aspects of Ionizing Radiation. 27 July 58, 15p. 24 refs. Rept. no. 349.
Order from LC mi$2.40, ph$3.30 PB 138 677

The K X-ray yield excited by beta-particles in various target materials increased with increasing target thickness up to a maximum, after which the yield decreased because of X-ray absorption by target material.

Boeing Airplane Co., Seattle, Wash.
RADIATION DAMAGE TO TRANSISTORS, by D. A. Hicks, D. V. Keller and others. Rept. on Contract AF 33(600)35030. 1 Dec 58, 124p. 19 refs. Document no. D5-2880.
Order from LC mi$6.30 PB 143 692

Studies of the radiation damage to 23 transistor types; power and frequency ranges for both silicon and germanium. The damage constant (K) for each transistor type was determined. The average values are $(4.2 \pm 0.2) \times 10^{13}$ nvt-μsec for n-base germanium, $(1.8 \pm 0.2) \times 10^{13}$ nvt-μsec for p-base germanium, $(3.1 \pm 0.4) \times 10^{12}$ nvt-μsec for n-base silicon, and $(4.6 \pm 3.3) \times 10^{12}$ nvt-μsec for p-base silicon. Larger K indicates smaller susceptibility to permanent radiation damage.

General Electric Research Lab., Schenectady, N.Y.
SURVEY OF RADIATION DAMAGE THRESHOLDS, by R. M. Walker. Scientific rept. no. 1 on Contract AF 19(604)5557. July 59, 33p. 70 refs. AFCRC-TN-59-552.
Order from LC mi$3.00, ph$6.30 PB 143 403

We will be concerned here only with the process known as direct displacement. It takes energy to force an atom into an interstitial position, and the distinguishing feature of the displacement process is that there is a minimum threshold energy which must be transmitted to the nuclei before damage occurs. The present report is a review of the existing information on threshold energies. The basic theory is reviewed in the first section. The experimental information is summarized in the second section. In the final section the present status of the problem is discussed and suggestions are made for future work.

PERSONNEL SUPPLIES AND PERSONAL EQUIPMENT

Naval School of Aviation Medicine, Pensacola, Fla.
READABILITY OF NAVCAD SELECTION TESTS, by Robert F. Lockman. 30 Sep 53, 6p. 6 refs. Proj. NM 001 057.16.05.
Order from LC mi$1.80, ph$1.80 PB 143 437

The results of this study demonstrate that the present tests in the NavCad selection battery as well as those under experimental evaluation are at suitable levels of reading difficulty for use with NavCad applicants. Thus, failure on any of these tests by an applicant must be assigned to some variable other than the complexity of the language of the tests. This report should be of interest to individuals in test construction and in selection and classification programs.

PHYSICS

Michigan U. Coll. of Engineering, Ann Arbor.
SCALAR DIFFRACTION BY AN ELLIPTIC CYLINDER, by N. D. Kazarinoff and R. K. Ritt. Rept. on Contract AF 19(604)4993. June 59, 27p. 7 refs. Rept. no. 2871-2-T; AFCRC-TN-59-394.
Order from LC mi$2.70, ph$4.80 PB 143 196

The method given in Reference 1 is applied to the case of scalar scattering by a perfectly reflecting elliptic cylinder illuminated by waves from a line source parallel to the axis of the cylinder. The surface distribution in the shadow zone is calculated, and the "creeping wave" representation for the scattered field in the shadow zone is derived. It is shown that the results are applicable if and only if $R_0\omega \gg 1$, where R_0 is the smallest radius of curvature on the cylinder and ω is the wave number.

New York U., N. Y.
FLUORESCENCE AND CONDUCTIVITY PHENOMENA, by Hartmut Kallmann. Quarterly rept. no. 4, Nov 55-Jan 56, on Contract DA 36-039-sc-64526. May 56, 47p.
Order from LC mi$3.30, ph$7.80 PB 138 936

Contents:
Gamma ray and U. V. induced fluorescence in solutions with more than one solvent
Further investigations into trap distributions and non-radiative transitions
(See also PB 135 933)

Acoustics

California U., Los Angeles.
THE ABSORPTION OF SOUND IN GAS MIXTURES, by Frank A. Angona. Technical rept. no. 5 on Contract N6onr-275(07). Jan 53, 89p. 25 refs.
Order from LC mi$4.80, ph$13.80 PB 143 216

California U., Los Angeles.
ABSORPTION OF ULTRASONIC WAVES IN AQUEOUS SOLUTIONS OF MAGNESIUM SULFATE, by Oscar Bryan Wilson, Jr. Technical rept. no. 4 on Contract N6onr-275(07). June 51, 97p. 23 refs.
Order from LC mi$5.40, ph$15.30 PB 143 215

California U., Los Angeles.
SOUND ABSORPTION IN MAGNESIUM SULPHATE SOLUTIONS, by David Alan Bies. Technical rept. no. 6 on Contract N6onr-275(07). June 53, 71p. 19 refs.
Order from LC mi$4.50, ph$12.30 PB 143 217

California U., Los Angeles.
A STUDY OF FINITE AMPLITUDE DISTORTION OF A SOUND WAVE IN AIR, by O. Norman Geertsen. Technical rept. no. 3 on Contract N6onr-275(07). May 51, 26p. 11 refs.
Order from LC mi$2.70, ph$4.80 PB 143 049

Carnegie Inst. of Tech., Pittsburgh, Pa.
ON THE SCATTERING OF WAVES BY A DISK, by Albert E. Heins and Richard C. MacCamy. Technical rept. no. 29 on Contract AF 49(638)227. June 59, 21p. 5 refs. AFOSR-TN-59-721.
Order from LC mi$2.70, ph$4.80 PB 143 773

[Max-Planck Inst. für Stromungsforschung (Germany)]
RESEARCH ON INVESTIGATION OF THE INTERACTION OF SOUND AND TURBULENCE, by [W. Tellmien]. Annual rept. for 1 Dec 56-30 Nov 57 on Contract AF 61(514)1143. [1958] 37p. 8 refs. [AFOSR-TN-58-236]; AD-154 138.
Order from LC mi$3.00, ph$6.30 PB 143 402

Investigation was made of the elementary process of scattering of sound by a vortex and of the dependence of the scattering properties on the characteristic parameters of the problem. Consideration is given to superposition of the effects of elementary scattering in a field of flow in which the vortices are statistically distributed due to an arbitrarily given distribution function controlling direction of the axis, size and circulation of the vortices. This case represents the turbulent motion. Because the distribution function can be chosen arbitrarily one can treat, for instance, isotropic as well as non-isotropic turbulence.

Metals Research Lab., Brown U., Providence, R. I.
SCATTERING OF ELASTIC WAVES IN ISOTROPIC MEDIA BY SPHERICAL OBSTACLES, by Norman G. Einspruch and Rohn Truell. Technical rept. on Contract DA 19-020-ORD-4581. 1 Dec 58, 109p. 27 refs. AD-209 373.
Order from LC mi$5.70, ph$16.80 PB 143 091

The method of Ying and Truell for studying the scattering of compressional elastic waves by simple spherical obstacles has been applied to the analysis of scattering of compressional elastic waves by a fluid filled cavity and by layered obstacles in which the core of the layered scatterer is a (a) cavity, (b) rigid sphere, (c) fluid filled cavity, (d) elastic material of properties different from those of the surrounding medium. A general expression for the scattering cross section offered to a compressional wave has been derived. An analysis of the scattering of transverse elastic waves by spherical obstacles has been performed.

RCA Defense Electronic Products, Camden, N. J.
DESIGN AND STUDY OF CORRELATION INSTRUMENTATION FOR SPEECH ANALYSIS AND SYNTHESIS, by D. T. Hoger and F. L. Putzrath. Scientific rept. no. 2 on Contract AF 19(604)4128. 31 July 59, 54p. 1 ref. AFCRC-TN-59-566.
Order from LC mi$3.60, ph$9.30 PB 143 360

This report covers the studies leading to the selection of an optimum analog instrumentation for processing the output signal of a Vocoder for digital transmission over a standard voice channel. The system is based upon the matching of the incoming voice events against a catalog of speech patterns so that only the pattern number, rather than the speech event itself, need be transmitted. In the receiver, the proper speech pattern is retrieved from a similar memory and generates the required voltages for the Vocoder synthesizer. The system that was treated in detail features completely analog processing so that small deviations in the pattern can readily be accommodated. Time sequential, rather than parallel pattern comparison, is employed. A single magnetic drum is used as the storage medium which can serve any number of voice channels. A complete analysis of the system was made and no serious implementation problems were encountered.

Institute of Mathematical Sciences, New York U., N. Y.
BASIC MATHEMATICAL RESEARCH FOR ELECTROMAGNETIC THEORY, by Morris Kline. Final rept. no. BR-25 on Contract AF 18(600)367. June 58, 19p. 24 refs. AFOSR TR-58-80; AD-158 369.
Order from LC mi$2.40, ph$3.30 PB 138 985

Naval Ordnance Lab., White Oak, Md.
MAGNETIC PROPERTIES OF THE MANGANESE CHROMITE-ALUMINATES, by Palmer L. Edwards. 1 May 58, 133p. 34 refs. NAVORD rept. 6099.
Order from LC mi$6.90, ph$21.30 PB 143 339

This paper reports on an experimental study of the magnetic properties of the spinel series $MnCr_2O_4$-$MnAl_2O_4$. This series was chosen for study because $MnCr_2O_4$ has a saturation moment at absolute zero which is inconsistent with the Néel theory and which has been attributed to the existence of Yafet and Kittel angles on the B sites by both Gorter and Lotgering. The $MnCr_2O_4$-$MnAl_2O_4$ series is particularly useful for such a study because there is only one type (approximately) of magnetic ion on each sublattice. The first chapter of this report gives an introduction to the molecular-field theory of magnetism leading up to the Neel theory of ferrimagnetism. The next chapter describes the preparation of the mixed-crystal series and the x-ray study to determine the locations of the magnetic ions on the A and B sublattices. The third chapter describes the experimental apparatus. The fourth chapter presents the Néel and the Yafet and Kittel theories. The fifth chapter presents the experimental data and compares it with the theories.

Westinghouse Electric Corp., East Pittsburgh, Pa.
THE EFFECT OF TEMPERATURE ON THE MAGNETIC PROPERTIES OF SILICON-IRON, COBALT-IRON AND ALUMINUM-IRON ALLOYS, by J. J. Clark and J. F. Fritz. Rept. on Magnetic Phenomena of Matter, Contract AF 33(616)5555. July 59, 57p. 3 refs. WADC Technical note 59-240.
Order from OTS $1.50 PB 161 078

The d-c and a-c magnetic properties of the following materials were measured over the temperature range from -60°C to 500°C: AISI silicon-iron grades M-36, M-22, M-19, M-14, M-6, Armco Oriented T-O-S, Hiperco 27, Hiperco 35, and 2.6% aluminum-iron. The data presented are: normal magnetization curves at various temperatures, normal permeability versus magnetizing force at various temperatures, coercive force and residual induction versus temperature, and total core loss at various inductions versus temperature. It is found that the low field permeability increases with increasing temperature, and the high field permeability decreases with increasing temperature, with a region between these two modes of variation in which the permeability is relatively stable over a limited temperature range. The coercive force, residual induction, and total core loss are all found to decrease with increasing temperature.

Air Research and Development Command, Washington, D. C.
NSIA-ARDC CONFERENCE ON MOLECULAR ELECTRONICS, NOVEMBER 13-14, 1958, WASHINGTON, D. C. [1958] 105p. 74 refs. ARDC-TR-59-17; AD-211 691.
Order from LC mi$5.70, ph$16.80 PB 143 131

Contents:
Stimulated emission of radiation
Paramagnetic effects
Two-level solid-state masers
Ferrite amplification
Parametric amplification on electron beams
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Colgate U., Hamilton, N. Y.
PREDICTION OF RADIATION INTENSITIES IN THE FRESNEL AND NEAR-ZONE REGIONS OF MICROWAVE APERTURE ANTENNAS, by Frank B. Harris, Jr. Rept. on Contract AF 30(602)1778. Oct 58, 28p. 4 refs. RADC-TN-58-252; AD-202 095.
Order from LC mi$2.70, ph$4.80 PB 138 621

The theory developed in this report makes possible the grouping together of whole families of theoretical apertures, insofar as certain gross properties of their fields are concerned. The information obtained is sufficient to give an upper limit to the radiation intensity at distances from the aperture between infinity and one or two times the largest semi-diameter. Numerical results have been obtained, and presented in graphical form, for the following cases: (1) circularly symmetrical aperture with illumination tapered in various ways, (2) elliptical aperture with uniform illumination and several different eccentricities, (3) rectangular aperture with illumination function separable in the aperture coordinates and any combination of a number of different tapers on the two axes.

Field Emission Lab., Pennsylvania State U., University Park.
A SEARCH FOR POLARIZATION OF FIELD-EMITTED ELECTRONS, by Walter T. Pimbley. Technical rept. no. 10 on Study of Metal Surfaces by the Field Emission Microscope, Contract AF 18(600)672. 62p. 35 refs. AFOSR-TN-622. AD-217 686.
Order from LC mi$3.90, ph$10.80 PB 143 174

Experiments were performed designed to detect polarization of field-emitted electrons using Mott scattering. Electrons emitted from various crystallographic planes of a clean tungsten surface, from individual quarters of a phthalocyanine quadruplet on a clean tungsten substrate and from single ferromagnetic domains of iron were analyzed in a temperature range from 21°K to 900°K. In no case was any polarization detected. The average least detectable asymmetry factor that could be determined by the apparatus was calculated to be .04 corresponding to a polarization of 10% in a plane normal to the field emitted beam.

Tung-Sol Electric, Inc., Bloomfield, N. J.
RESEARCH AND DEVELOPMENT IN UTILIZATION OF SELF-SUSTAINED ELECTRON EMISSION INVESTIGATION, by B. G. Firth. Quarterly progress rept. no. 7 for 1 Jan-31 Mar 58 on Investigation in Utilization of Self-Sustained Field Emission, Contract DA 36-039-sc-73051. [1958] 33p. 4 refs. AD-211 532.
Order from LC mi$3.00, ph$6.30 PB 143 878

Molecular Physics and Spectroscopy

Guggenheim Jet Propulsion Center, Calif. Inst. of Tech., Pasadena, Calif.
EMISSIVITY ESTIMATES FOR HEATED NO, by A. Thomson. Technical rept. no. 6 on Contract AF 18(603)02. Nov 57, 47p. 8 refs. AFOSR-TN-57-782; AD-148 388.
Order from LC mi$3.30, ph$7.80 PB 143 512

The emissivity of the β and γ systems of NO has been calculated between 4000°K and 8000°K for a range of optical densities. Both the positions and intensities of the bands were assumed to be distributed statistically. An approximately uniform average value for the square of the vibrational matrix elements was assigned to all contributing transitions. The emissivity was calculated at low pressure (pure Doppler broadening) and at high pressure (no rotational fine structure). It is found that, for the specified temperature range, the error induced by neglecting the rotational fine structure is less than 40%. The results obtained do not differ by more than about 50% from those described by Kivel, Mayer and Bethe although the analytical procedure is quite different.

Institute of Engineering Research, U. of California, Berkeley.
SPECTRAL REFLECTIVITY OF CERTAIN MINERALS AND SIMILAR INORGANIC MATERIALS, by J. T. Gier and R. V. Dunkle. Rept. on Contract DA 11-190-eng-3. 29 Jan 54, 16p. 5 refs. Series no. 62, issue no. 4.
Order from LC mi$2.40, ph$3.30 PB 128 131

Results were obtained with the heated cavity reflectometer. The spectral reflectivity of certain minerals indicates a nonuniformity of emissivity which would alter the equilibrium temperatures of these materials when exposed to the natural environment.

Naval Ordnance Lab., Corona, Calif.
SPECTROSCOPY CONFERENCES IN FRANCE AND ENGLAND, SEPTEMBER 1957, by Curtis J. Humphreys. Aug 58, 16p. 5 refs. NOLC rept. 417; AD-203 412.
Order from LC mi$2.40, ph$3.30 PB 138 806

A digest of data gathered during trip.

Ohio State U. Research Foundation, Columbus.
DESIGN AND DEVELOPMENT OF AN ELECTRON SOURCE WITH VELOCITY SELECTION BEFORE SCATTERING, by Edwin N. Lassettre and Ausma Skerbele. Final rept. on Contract AF 19(604)3078. Feb 59, 39p. 10 refs. Rept. 803-Final; AFCRC-TR-59-237; AD-214 416.
Order from LC mi$3.00, ph$6.30 PB 143 284

The design, construction, and testing of a new electron source is described. This source incorporates an electrostatic analyzer for velocity selection on the electron beam before scattering. Several electron impact spectra are included and discussed

Ohio State U. Research Foundation, Columbus.
ENERGY MOMENT TREATMENT OF THE QUANTUM MECHANICAL ASYMMETRIC ROTATOR, by Paul M. Parker and L. Carlton Brown. Technical note no. 6 on Contract AF 18(600)772. 1958, 109p. AFOSR TN-58-371; AD-154 277.
Order from LC mi$5.70, ph$16.80 PB 139 010

Quantum mechanical rotators are classified as spherical, symmetric, and asymmetric tops. If the equilibrium values of all three principal moments of inertia of the top are equal it is called a spherical top; if two are equal but different from the third it is called a symmetric top; if all are different it is called an asymmetric top; the special case of a symmetric top whose unique moment is very much smaller than its other two moments is the case of the linear molecule. The present work is principally concerned with deducing certain sum rules relating energies of the asymmetric top to some of the physical constants of the molecule. Augmented by the sum rules already given by Mecke, these rules permit in many cases the computation of the effective values of the principal moments of inertia of the molecule investigated with much less effort than is usually met in either numerical approximation methods or perturbation calculations if the latter are applicable at all.

Padova U. (Italy).
ON THE ELECTRONIC AND MICROWAVE SPECTRUM OF FORMYL FLUORIDE, by G. Semerano. Final technical rept. for 1 Jan-30 Dec 58 on Contract DA 91-508-EUC-275. [1958] 31p. 9 refs. AD-214 792.
Order from LC mi$3.00, ph$6.30 PB 143 052

Spectroscopy Lab., Pennsylvania State U., University Park.
TECHNICAL REPORT, 1 JULY 1956-1 JULY 1958. Rept. on Contract Nonr-656(12). [1958] 99p. 80 refs.
Order from LC mi$5.40, ph$15.30 PB 143 097

High resolution with a diffraction grating. D. H. Rank, A. H. Guenther, C. R. Burnett and T. A. Wiggins

Tertiary interferometric wavelength standards from measurements on lines of the 2-0 band of carbon monoxide and derived wavelength standards for some lines of the 1-0 band of carbon monoxide. The velocity of light serived from a band spectrum method, IV. D. H. Rank, A. H. Guenther, G. D. Saksena, J. N. Shearer and T. A. Wiggins

l-type doubling in three Π - Π bands HCN. D. H. Rank, J. N. Shearer, A. H. Guenther and T. A. Wiggins

Shrinkage effect in grating resolution measurement. D. H. Rank

Dispersion of a double-pass spectrograph. T. A. Wiggins and G. D. Saksena

Shape or an emission line of CH produced in an oxy-acetylene flame. D. H. Rank, G. D. Saksena and T. A. Wiggins

Internuclear distance and l-type doubling in carbon bisulfide. A. H. Guenther, T. A. Wiggins and D. H. Rank

Measurements of the dispersion of air from 3651 to 15300 angstroms. D. H. Rank, G. D. Saksena and T. K. McCubbin, Jr.

An analysis of the data on the index of refraction of germanium. D. H. Rank and T. A. Wiggins

Optics

Air Force Missile Development Center, Holloman AFB, N. Mex.

THE PROOF OF CERTAIN LAWS OF OPTICS USED IN SOLAR FURNACE CALCULATIONS, by Alfred W. Simon. Mar 59, 11p. 3 refs. AFMDC-TN-59-1; AD-209 326.
Order from LC mi$2.40, ph$3.30 PB 138 733

Several laws of optics assumed without proof in a previous report dealing with calculations on the solar furnace are proved in detail. They are (1) that the fractional part of the light reflected at each point of reflection of a plane parallel glass plate is the same, (2) that the fractional part of the light refracted at each point of refraction of a plane parallel glass plate is the same, and (3) that the sum of the fractional part of the light incident on any surface of a plane parallel glass plate reflected therefrom and the fractional part refracted therefrom is equal to unity. Finally the laws of reflection of a metallic surface with a glass superstrate are deduced.

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.

LENS SYSTEM DESIGNED FOR WATER-TO-AIR VISION IN THE SUBMERGED HUMAN EYE, by T. D. Duane, R. J. Emrich, and Herbert G. Shepler. Rept. no. 3 on Proj. NM 11 03 12.2. 2 Sep 58, 14p. 1 ref. NADC-MA-5810.
Order from LC mi$2.40, ph$3.30 PB 139 147

Since the human eye is primarily adapted to air vision, the requirements demanded in water-to-air vision presents a challenging problem. One method of accomplishing this task is reported in this study. The method reported involves the use of a lens system which is a combination of a plano-convex lens 4.0 cm. in diameter, 12 diopters in strength mounted on the right side of a standard spectacle frame. Superimposed on the fixed lens was a moveable 52 diopter biconvex lens 2.0 cm. in diameter. The smaller lens could be moved farther from the fixed lens resulting in variations extending from 64 to 80 plus diopters.

Cruft Lab., Harvard U., Cambridge, Mass.

THE ELECTROMAGNETIC THEORY OF LIGHT. II, by Tai Tsun Wu and S. R. Seshadri. Scientific rept. no. 22 on Contract AF 19(604)786. 10 Nov 58, 25p. 5 refs. AFCRC-TN-58-575; AD-117 050.
Order from LC mi$2.70, ph$4.80 PB 138 613

A systematic procedure is given for the determination of the asymptotic series for the field in the shadow region of a convex cylinder illuminated by a plane wave. The first two terms in the series are explicitly evaluated.

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.

SUGGESTED METHOD FOR MEASURING LOW-LIGHT-LEVEL LUMINANTS, by Robert Davis and Jesse Tyroler. July 59, 17p. Technical rept. 2619; AD-214 770.
Order from LC mi$2.40, ph$3.30 PB 143 296

Low-level-luminosity measurements have in the past been carried out by a subjective photometric comparative method. Measurements made by this procedure are inherently inaccurate. This report suggests a system for absolute comparison which uses a defined spectral visibility curve for low-level-luminosity (scotopic) measurements. The suggested system does not employ visual observations and consequently its deviations arise only from experimental error. It also has the advantage of enabling the operator to positively observe smaller deviations in luminosity during testing. This system makes it possible for rigid specifications to be drawn by any agency concerned with the measurement of low-level luminosities.

Institute for the Study of Metals, U. of Chicago, Ill.

A METHOD OF PREPARING THIN FILMS OF ALLOYS SUITABLE FOR OPTICAL STUDIES, by L. G. Schulz. Rept. on Contract AF 18(600)1489. Feb 59, 17p. 8 refs. AFOSR TN-59-25; AD-208 755.
Order from LC mi$2.40, ph$3.30 PB 138 702

The components of the desired alloy are evaporated successively and the alloy is then produced by diffusion. This results in a sample of approximately uniform thickness with pure metal components at the ends and with a composition gradient in between.

Navy Underwater Sound Lab., Fort Trumbull, New London, Conn.

OPERATING CHARACTERISTICS OF A LEAD SULFIDE CELL WITH VARYING BACKGROUND BRIGHTNESS, by Paul Brannon. 25 Sep 57. 18p. USL

Research rept. no. 363; AD-205 883.
Order from LC mi$2.40, ph$3.30 PB 143 425

An elementary study was made of the operating characteristics of an Eastman Kodak "Ektron" 2 mm x 2 mm, lead sulfide, photo-conductive detector against varying background brightness. The signal from a tungsten lamp, chopped at 1000 cps, was reflected by means of a small plane mirror into a receiver pointed either at the sky or at an artificial background. Measurements of signal-to-noise ratio, detector resistance voltage and current, and brightness of the background were made for varying background and load resistance. The effect of placing an infrared filter in front of the receiver was also determined. It was found that a cell load resistance of about 1 megohm and a cell current of 20 microamperes gave the best operating signal-to-noise ratio over a sky background which varied from 0 to 10,000 foot-lamberts. By placing an infrared filter in front of the receiver, the ratio was increased for background brightness above 30 foot-lamberts and was decreased below this value of brightness.

Visibility Lab., U. of California, San Diego.
CANONICAL FORMS OF THE EQUATION OF TRANSFER, by R. W. Preisendorfer. Rept. on Contract NObs-72092. 1 July 58, 16p. 4 refs.
SIO Ref. no. 58-47; AD-201 548.
Order from LC mi$2.40, ph$3.30 PB 143 324

The purpose of this note is to present a reformulation of the equation of transfer which appears to be of help in the task of collating and understanding the experimentally obtained properties of the optical medium. Quite interestingly, this reformulation appears to hold the key to the solution of one of the long-standing theoretical problems of this field, namely the problem of the existence and form of the asymptotic radiance distribution in an arbitrary medium with arbitrary external lighting conditions.

Solid State Physics

Battelle Memorial Inst., Columbus, Ohio.
PROPERTIES OF SOLID OXIDES, by C. G. Harman, L. D. Loch and C. R. Austin. Special rept. June 48, 258p. 459 refs. NEPA-808; BMI-N-16
Order from LC mi$11.10, ep$42.60 PB 143 943

A survey was made of the properties of all known solid oxides, which are described in the literature, and the assembled information is presented in this report for ready reference to facilitate the progress of the NEPA program. In the preparation of this report, particular attention was directed toward presentation of the information in a systematic and useful form. The data are arranged in the order in which the elements appear in the periodic table. Some of the data are very old, and are of limited usefulness, but are included for the sake of completeness. It should be pointed out that, even after inclusion of all published data without regard to reliability, many important gaps exist in the literature on the properties of many of the materials.

Brown U., Providence, R. I.
RESEARCH DIRECTED TOWARD THE INVESTIGATION OF SILICON AND SILICON-CARBIDE SURFACES, by J. A. Dillon, Jr. and R. M. Oman. Scientific rept. no. 3, 1 Apr-30 June 59, on Contract AF 19(604)4568. July 59, 11p. 5 refs. AFCRC-TN-59-384.
Order from LC mi$2.40, ph$3.30 PB 143 632

Investigation of the properties of SiC surfaces following chemical treatments. Differences in etching is presumably due to the asymmetry in atomic species on opposite faces. There appeared to be no correlation between this etching behavior and such gross surface properties as defect density and stepped structure. (See also PB 140 823)

Cornell U., Ithaca, N. Y.
OXIDATION OF MAGNESIUM SINGLE CRYSTALS AND EVAPORATED FILMS, by Richard R. Addiss, Jr. Technical rept. no. 1 on Contract Nonr-401(31). May 58, 95p. 35 refs.
Order from LC mi$5.40, ph$15.30 PB 138 822

Apparatus and techniques were developed for measuring the oxidation of magnesium single crystals at high temperatures, and evaporated magnesium films at room temperature, with a sensitive microbalance capable of operating in an ultra-high vacuum. Single crystals were oxidized at an oxygen pressure of 2.5 mm Hg and temperatures of 400 and 440° C.

Harvard U. Div. of Engineering and Applied Physics, Cambridge, Mass.
THE FORMATION OF SURFACE PITS BY THE CONDENSATION OF VACANCIES, by P. E. Doherty and R. S. Davis. Rept. on Contract Nonr-1866(27). 5 May 58, 13p. 11 refs.
Order from LC mi$2.40, ph$3.30 PB 138 820

The formation of these pits during cooling is attributed to the condensation of vacancies at specific location of the free surface. A definite and constant supersaturation of vacancies is required before condensation begins.

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
THE USE OF FOURIER TRANSFORMS FOR THE STUDY OF SINGULAR POINTS IN THE FREQUENCY SPECTRUM OF A CRYSTAL, by J. Peretti and A. Maradudin. Rept. on Contract AF 18(600)1315. Nov 58, 11p. 4 refs. Technical note BN-155; AFOSR TN-59-21; AD-208 751
Order from LC mi$2.40, ph$3.30 PB 138 783

Institute of Optics, U. of Rochester, N. Y.
RESEARCH ON OPTICAL AND ELECTRICAL PROPERTIES OF SOLIDS, by David Dutton. Final rept. on Contract AF 18(600)193. Sep 58, 8p. 31 refs. AFOSR TR-58-100; AD-162 214.
Order from LC mi$1.80, ph$1.80 PB 138 653

Abstracts of 16 reports which have been published by Technical societies by the authors on experimental studies of photoconductivity, luminescence, and optical absorption in various materials including the alkali and silver halides, the thallous halides, cadmium sulfide, lead sulfide, and lead selenide.

Materials Research Lab., Watertown Arsenal, Mass.
A REFORMATION OF THE TEMPERATURE DEPENDENCE OF THE DEBYE CHARACTERISTIC TEMPERATURE AND ITS EFFECT ON DEBYE-WALLER THEORY, by Arthur Paskin. Apr 57, 12p. 10 refs. MRL rept. no. 27.
Order from LC mi$2.40, ph$3.30 PB 127 593

Zener and Bilinsky have explained the observed high-temperature deviations from the Debye-Waller theory of the temperature dependence of the intensity of x-ray diffraction spectra in terms of the changes in Θ, the Debye characteristics temperature, as the temperature is raised. Their formulation for the temperature dependence of Θ is in terms of an empirical constant and the lattice enthalpy. We here give an alternative formulation in terms of the Grüneisen constant and the volume. The two formulations of the temperature dependence of Θ are found to yield approximately the same results for NaCl and KCl. The Debye-Waller factor has also been modified so as to yield a relationship linear in a reduced temperature scale that compensates for the change in Θ as the temperature is changed. The x-ray data when appropriately plotted do yield a straight line in agreement with the modified Debye-Waller factor. The slope of the straight line can be used to find the room temperature value of Θ. The values found for NaCl and KCl are in reasonable agreement with values for Θ obtained from specific heat measurements.

Naval Research Lab., Washington, D. C.
SOME STRUCTURAL GUIDES TO THE DEVELOPMENT OF HIGH DIELECTRIC CONSTANT ESTERS FOR CAPACITORS, by J. B. Romans and C. R. Singleterry. 18 Sep 59, 25p. 39 refs. NRL rept. 5350
Order from OTS $1.00 PB 151 797

It has been found possible to use molecular structure as an effective guide to the synthesis of practical liquids of high dielectric constant. For this purpose, dipole moments estimated from molecular structure by the generalizations listed are inserted in the Onsager equation relating dipole moment and dielectric constant. In order to obtain liquids of high dielectric constant, the dipole moment content per unit volume must be at a maximum. This is achieved with fluoroesters through the use of the lower telomeric fluoroalkyl groups containing the $-CF_2H$ terminal group and by increasing the number of ester groups to three. High dielectric constants are also significantly favored by the presence of groups, such as aromatic rings or chlorine substituents, which have high electronic polarizability. The application of these principles has led to the synthesis of five fluoroesters having dielectric constants of 8 or above. A route is indicated for the preparation of stable esters having dielectric constants at least as high as 12.

Pacific Semiconductors, Inc., Culver City, Calif.
SOLID STATE DIFFUSION IN SEMICONDUCTOR MATERIALS, RESEARCH ON, by T. J. LaChapelle. Final technical rept. no. 2, 1 Aug 57-31 July 58, on Contract AF 18(603)117. [1958] 58p. PSI rept. no. 3000:5-10-F.
Order from LC mi$3.60, ph$9.30 PB 137 815

High purity p-type pulled ingots as well as floating zone silicon were used in the studies. Diffusion of phosphorus from the elemental form was carried out at 1039, 1105 and 1155°C. All silicon having surface damage, in spite of careful lapping, produced abnormal impurity distributions which could not be matched to the expected error function complement curves. Diffusion coefficients for the micron-thin runs seemed to be at least a factor of 2 or 3 higher than the current literature, probably mainly because of either surface damage or bulk structural imperfections or both.

Pennsylvania State U. Coll. of Mineral Industries, [University Park].
HYDROTHERMAL CRYSTAL STUDIES, by Rustum Roy, R. C. DeVries and others. Final rept. for 1 Apr-30 June 54 on Contract DA 36-039-sc-5594. 15 July 54, 153p. 8 refs.
Order from LC mi$7.50, ph$24.30 PB 143 126

Phase equilibrium studies of titanate systems and new equilibrium diagrams for several different types of systems involving $BaTiO_3$. Hydrothermal techniques have been used in two main areas of work: determination of trivalent oxide-water systems and a study of the formation, properties and stability of the layer silicates; the chlorites and disilicic micas. (See also PB 140 195)

Pennsylvania State [U.] Mineral Industries Experiment Station] [University Park]
HYDROTHERMAL CRYSTAL STUDIES, by Rustum Roy and E. F. Osborn. Final rept. for 1 July 51-30 June 54 on Contract DA 36-039-sc-5594. [1954] 12p.
Order from LC mi$2.40, ph$3.30 PB 143 124

The entire three-year period is summarized briefly. Seventeen technical reports are listed. Possible utilization or further study of some of the phases of the work is discussed. (See also PB 143 126)

Stanford Research Inst., Menlo Park, Calif.
LUMINESCENCE OF SOLIDS PRODUCED BY SURFACE RECOMBINATION OF ATOMS, by Kenneth M. Sancier, William J. Fredericks and others. Technical rept. no. 1 on Contract AF 49(638)353. 15 June 59, 40p. 17 refs. AFOSR TN-59-716.
Order from LC mi$3.00, ph$6.30 PB 143 297

During the heterogeneous recombination of atoms on surfaces of solid lumophors the energy released in the process may be converted to luminous energy of the lumophor. The purpose of the present investigation is the elucidation of the mechanism and efficiency of energy transfer. Included in this investigation are the effects of atom species, atom concentration, lumophor temperature, and lumophor composition. A model is

presented which describes the processes of chemical reaction and energy transfer associated with luminescence produced by heterogeneous atom recombination.

Technical Research Group, Syosset, N. Y.
DEVELOPMENT OF THE PERIODIC SHOCK WAVE TECHNIQUE AND ITS APPLICATION TO THE PREPARATION OF SEMICONDUCTOR SILICON CARBIDE. Final rept. for 15 Aug 57-14 Aug 58 on Contract AF 19(604)2665. [1958] 65p. 27 refs. AFCRC TR-58-193; AD-160 872.
Order from LC mi$3.90, ph$10.80 PB 138 704

Contents:
Literature search
Development of periodic shock technique
Experiments with piston-driven tubes
Jet resonance tube
Jet resonance tube pressure measurement
Temperature measurements
Experimental
Synthesis of silicon carbide from silicon tetrachloride and hydrocarbon
Synthesis of silicon carbide from methyltrichlorsilane
Analysis of methyltrichlorsilane

Uppsala U. (Sweden).
THE CRYSTAL STRUCTURE OF $SeOCl_2 \cdot 2C_5H_5N$, by Günther Nahringbauer and Ingvar Lindqvist. Technical note no. 2 on Contract AF 61(052)43. 20 Dec 58, 17p. 19 refs. AFOSR TN-59-64; AD-209 608.
Order from LC mi$2.40, ph$3.30 PB 138 710

The crystal structure of the addition compound $SeOCl_2 \cdot 2C_5H_5N$ has been determined and refined using three-dimensional X-ray data.

Theoretical Physics

Maryland U., College Park.
UNIQUENESS OF SOLUTIONS TO DISPERSION RELATIONS AND AN ITERATIVE SCHEME, by David Y. Wong. Rept. on Contract AF 49(638)24. July 57, 11p. Physics Dept. Technical rept. no. 85; AFOSR TN-57-468; AD-136 459.
Order from LC mi$2.40, ph$3.30 PB 129 566

For a given set of low energy limits of the S-matrix, the solution of the dispersion relation for the scattering of light is shown to be non-unique even if one fixes all but the s-wave phase shift. Here the unitarity condition is also implied. It is known [D. Y. Wong and J. S. Toll, Annals of Phys. 1, 91 (1957)] that if one further assumes the convergence of the usual perturbation method, then the low energy limits do determine the physical solution uniquely. An alternative iterative scheme is suggested without recourse to the expansion in powers of a coupling parameter. The procedure is illustrated by the example of the scattering by a hard sphere.

Microwave Lab., Stanford U., Calif.
THE LAGRANIAN AND THE ENERGY MOMENTUM TENSORS IN THE PERTURBATION THEORY OF CLASSICAL ELECTRODYNAMICS, by E. L. Chu. Scientific rept. no. 12 on Contract AF 19(604)1930. May 59, 29p. 18 refs. M. L. rept. no. 599; AFCRC TN-59-199; AD-216 104.
Order from LC mi$2.70, ph$4.80 PB 142 983

The theory of infinitesimal transformations is incorporated in the variational principle for the solution of perturbation problems in classical electrodynamics. Every variable quantity is transformed to the unperturbed coordinate system and expanded into a power series of a small perturbation parameter. The Lagrangian of any given order of magnitude in the unperturbed coordinate system characterizes a closed physical system. This is proved by showing that the total energy-momentum tensors of the first and second orders are symmetric. The proof for the higher orders is obtained by deduction.

Scuola di Perfezionmento in Fisica Teorica e Nucleare, Mostra d'Oltremare, Naples (Italy).
SPECIAL TOPICS IN THEORETICAL PHYSICS. Final Technical rept. no. 1 for 1 May 58-30 Apr 59 on Contract DA 91-508-EUC-306. [1959] 10p. 4 refs.
Order from LC mi$1.80, ph$1.80 PB 143 111

An account is given, without formal developments - for which reference is made to the Scientific Reports already submitted or in elaboration - of the results obtained thus far in our investigation of the renormalization problem in field theory.

Syracuse U. [Research Inst.] N. Y.
DISTRIBUTION FUNCTIONS FOR NON-COMMUTING OPERATORS, by A. O. Barut. Technical note P-10 on Contract AF 18(600)459. July 57, 19p. AFOSR-TN-57-435; AD-136 425.
Order from LC mi$2.40, ph$3.30 PB 129 563

The properties of a certain class of functions f $(\alpha', \beta', \gamma',)$ of non-commuting observables $\alpha, \beta, \gamma,$ are investigated. They have all the usual properties of distribution functions, except that they are complex. They satisfy simple Markoff-type stochastic equations and permit to find the expectation values unambiguously. Conversely quantum theory can be formulated in terms of such distribution functions having the prescribed properties.

Thermodynamics

Ballistic Research Labs., Aberdeen Proving Ground, Md.
DEVIATIONS FROM THERMAL EQULIBRIUM IN SHOCK WAVES, by H. A. Bethe (Cornell U.) and E. Teller (George Washington U.) [1940, reprinted 1959]. 81p. 5 refs.
Order from OTS $2.25 PB 161 102

Ballistic Research Labs., Aberdeen Proving Ground, Md.
TABLES OF THERMODYNAMIC AND SHOCK FRONT PARAMETERS FOR AIR, by R. E. Shear and B. D. Day. May 59, 29p. 8 refs. Memo rept. no. 1206.
Order from LC mi$2.70, ph$4.80 PB 143 329

From the reports: "Tables of Thermal Properties of Gases," National Bureau of Standards Circular 564 and, "Tables of Argon Free Air up to 15000°K," Arnold Engineering Development Center, TN-56-12, by Hilsenrath et al., tables of the thermodynamic properties of air, such as, density, internal energy, temperature and sound velocity have been obtained as a function of pressure at constant entropy. In addition, shock front parameters, as functions of shock velocity, were calculated. The initial state of the air is taken to be at rest, $u_o^* = 0$, at a pressure of one atmosphere and a temperature of 300°K. The remaining quantities, such as c_o^*, ρ_o^*, are given by the ideal gas relationships. The value of R_o^* is 2.83286 $\frac{\text{atm cm}^3}{\text{g } ^\circ\text{K}}$.

Battelle Memorial Inst., Columbus, Ohio.
THE DESIGN OF A HEAT EXCHANGER FOR COOLING GASES WHICH CONTAIN LARGE QUANTITIES OF PARTICULATE MATERIAL, by A. A. Putnam and J. M. Allen. Rept. on Contract AF 40(600)710. Oct 58, 39p. 4 refs. AEDC-TR-58-16; AD-203 562.
Order from LC mi$3.00, ph$6.30 PB 143 277

This report is one of a group of four resulting from research on the deposition of particles from a flowing gas stream. The phenomenon of particular concern herein is the deposition of small boron oxide particles onto heat-exchanger elements. The particles, which are extremely small in size, are generated in large concentrations from the combustion of boron-containing, high-energy fuels.

General Electric Co., Cincinnati, Ohio.
HIGH TEMPERATURE HEAT TRANSFER FROM GASES TO CYLINDERS AND NOZZLES, by I. E. Kanter, F. Martinek and M. L. Ghai. Technical note for 1 Feb 58-28 Feb 59 on Contract AF 49(638)243. [1959] 137p. 29 refs. AFOSR-TN-59-488; AD-215 841.
Order from LC mi$6.90, ph$21.30 PB 143 597

A gas stabilized plasma generator operating with nitrogen gas and water cooled metal electrodes has been successfully operated to supply the hot gas necessary for this study. The required instrumentation has been, or is being, developed to measure the various temperatures, flow velocities, and power consumption rates experienced with the generator and associated equipment. Preliminary temperature traverses and photographic studies have been made to investigate the flow field of the effluent gas. Calculations are presented for the thermodynamic properties of nitrogen gas at high temperatures including the pressure effect. Also included are the general considerations on experimentation and data reduction as pertains to this study.

Massachusetts Inst. of Tech., Cambridge.
FURTHER STUDIES OF THERMAL CONVECTION, by Hsiao-lan Kuo. Scientific rept. no. 7 on General Circulation Project, Contract AF 19(604)1000. 1 Feb 57, 50p. 21 refs. AFCRC-TN-57-267.
Order from LC mi$3.30, ph$7.80 PB 127 915

Part I is concerned with the stability of the thermally driven motions in a rotating fluid. In part II some aspects of fluid motions produced by horizontal differential heating are discussed by applying energy integrals. In part III the mean temperature distribution resulting from the thermal convection produced by uniform heating from below is determined by applying the thermal energy integrals.

Naval Research Lab., U. of Wisconsin, Madison.
THE CONTRIBUTION OF BOUND, METASTABLE, AND FREE MOLECULES TO THE SECOND VIRIAL COEFFICIENT, by Daniel E. Stogryn and Joseph O. Hirschfelder. Rept. on Contract N7onr-28511. rev. 4 Nov 58. 71p. 18 refs. WIS-ONR-32a; AD-207 790.
Order from LC mi$4.50, ph$12.30 PB 143 486

The second virial coefficient for molecules interacting with a spherically symmetric potential is divided into three parts: (1) a contribution B_b, related to the equilibrium constant for the formation of bound double molecules; (2) a contribution B_m, related to the equilibrium constant for the formation of metastably bound double molecules; and (3) a contribution B_f, due to molecules which interact but are free to separate after the interaction. Equations are given for determining each of the three parts of the second virial coefficients. A detailed treatment of these three contributions is presented for the square well, Sutherland, and Lennard-Jones (6-12) potentials.

Pomona Coll., Claremont, Calif.
FUNDAMENTAL STUDY OF SOLID SURFACES, by R. Nelson Smith. Final rept. on Contract N8onr-54700. 31 Dec 57, 10p. 27 refs. AD-151 322.
Order from LC mi$1.80, ph$1.80 PB 138 631

Thermodynamics of adsorption: Adsorption isotherms were determined for various adsorbates on a pure nonporous graphite at different temperatures. Differential net heats of adsorption were calculated by the isosteric method. The results indicated that these net heats decreased rapidly with coverage and persisted through several statistical layers of adsorbate. An equation is proposed for type II multilayer adsorption. A new type isotherm was observed for MeOH on graphite and Graphon. The structure of porous solids: Several arguments are described which were put forth to show that previous BET (Brunauer, Emmett, and Teller) surface areas for porous solids were unrealistically high by a factor of 4 to 20. Hysteresis effects in desorption phenomena are discussed. Studies showed that steam activation enlarges the capillary pores of charcoal instead of creating more pores of the same diameter. The nature of adsorbed films: Consideration is given to the adsorption of benzene and cyclobenzene by nonporous graphite and of H_2O and NO by carbon. Carbon surface complexes: The catalytic oxidation of CO by N_2O on carbon surfaces was studied between 300° and 500°C. The C-O surface complexes did not appear to act as intermediates in the reaction. The

nature and mechanism of the reaction between NO and carbon surfaces was investigated above room temperature. The products are substantially N and CO_2.

Wave Propagation

Carnegie Inst. of Mathematics, Pittsburgh, Pa.
DIFFRACTION BY TWO HALF PLANES WITH LINE SOURCE EXCITATION, by Robert C. Gast. Technical rept. no. 25 on Mathematical Analysis of Electrical and Mechanical Systems, Contract DA 36-061-ORD-490. May 56, 46p. 4 refs. CIT-ORD-6D-TR25; AD-95 360.
Order from LC mi$3.30, ph$7.80 PB 130 623

The problem considered is that of a monochromatic, electromagnetic wave being emitted by a line source which is parallel to the edges of two semi-infinite, parallel, perfectly conducting plates of zero thickness. The edges of the plates are infinite straight lines which are parallel to the z-axis of a Cartesian coordinate system and intersect the y-axis at $y = \pm \frac{a}{2}$. The plates are of infinite extent in the positive x-direction.

Cornell U. School of Electrical Engineering, Ithaca, N. Y
MICROWAVE TRANSHORIZON PROPAGATION. Final rept. on Contract AF 30(602)1408. 1 Dec 56, 10p. Research rept. EE-320; RADC TR-57-47; AD-114323.
Order from LC mi$1.80, ph$1.80 PB 138 652

The diversity parameters on which techniques are based are space, angle, frequency, and time. Progress has been made during this period with regard to space and angle diversity. This progress is described in detail.

New York U., N. Y.
A STUDY OF THE GENERATION AND DETECTION OF ELECTROMAGNETIC WAVES IN THE MILLIMETER WAVE REGION, by J. H. Rohrbaugh. Scientific rept. no. 2, 1 Dec 57-28 Feb 58, on Millimeter Wave Project, Contract AF 19(604)2673. 1 Mar 58, 17p. AFCRC TN-58-157; AD-152 388.
Order from LC mi$2.40, ph$3.30 PB 138 655

The new experiments on magnetron harmonics are now fully operative. They will involve a study of third harmonic production as the magnetic field distribution at the tube is varied. The new spectrometer has had necessary modifications made to the output optical beam. Its drying tower has been substantially completed while work was going on on its amplifiers and its detecting circuit.

Syracuse U. Research Inst., N. Y.
METHODS OF GENERATION AND CHARACTERISTICS OF CIRCULARLY POLARIZED WAVES, by David K. Cheng, Richard E. Gildersleeve, and Thomas M. Maher. Final rept. for 1 Jan 56-30 Sep 57 on Contract AF 30(602)1463. 31 Oct 57, 138p. 39 refs. SURI rept. no. EE393-5710F; RADC-TR-58-41; AD-148 659.
Order from LC mi$6.90, ph$21.30 PB 143 489

This contract had three major objectives, namely: (1) study of the general properties of elliptically polarized waves; (2) survey of the methods of generating circularly polarized waves and analysis of the more promising methods; and (3) investigation of the effects of distorted reflectors and defocused primary sources on the polarization and radiation characteristics.

Syracuse U. Research Inst., N. Y.
STUDY ON THE SCATTERING OF ELECTROMAGNETIC WAVES BY A PARABOLOID OF REVOLUTION, by Alfred T. Villeneuve. Task rept. no. 3 on Contract AF 30(602)1640. 20 Dec 57, 41p. 13 refs. SURI rept. EE492-5712T3; RADC-TN-58-79; AD-148 642.
Order from LC mi$3.30, ph$7.80 PB 143 525

RESEARCH METHODS, TECHNIQUES AND EQUIPMENT

Naval Ordnance Lab., Corona, Calif.
FOUNDATIONAL RESEARCH PROJECTS. Quarterly rept. no. 2 for period ending 31 Mar 54. Aug 54, 112p. 11 refs. NOLC rept. 184.
Order from LC mi$6.30, ph$19.80 PB 143 789

Contents:
DART
Ferromagnetic resonance
DC-FM converter
Infrared sources
Small antenna investigation

Stanford U., Calif.
NOTE ON ESTIMATING INFORMATION, by Colin R. Blyth. Technical rept. no. 17 on Contract Nonr-225(21) 24 Jan 58, 19p. 4 refs.
Order from LC mi$2.40, ph$3.30 PB 139 170

Estimation of the Shannon-Wiener measure of information. Low bias estimates are obtained, and their bias and variance.

Communication Theory

Air Force Cambridge Research Center, Bedford, Mass.
SIGNAL TO NOISE IMPROVEMENT THROUGH CODING, by John C. Mott-Smith. May 59, 20p. 2 refs. AFCRC-TR-59-143; AD-215 115.
Order from LC mi$2.40, ph$3.30 PB 143 493

The error rate of a binary symmetric memoryless channel is a function of an "effective" signal-to-noise ratio that combines the input signal-to-noise ratio with the time bandwidth product. The capacity of this channel is found for four different error rate expressions corresponding to correlation detection under varying assumptions. The derived capacity is interpreted as the maximum rate achievable through digital encoding while satisfying an arbitrary reliability requirement. The results are presented in terms of the maximum signal-to-noise ratio improvement achievable by such codes as a function of the maximum allowable error rate. The practical limitations of the simple model are briefly discussed. An example illustrates the conclusions to be drawn through this type of analysis.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
SUGGESTIONS ON A DEVICE FOR DIGITAL ENCODING OF RUSSIAN SCIENTIFIC TEXT, by Martin H. Weik. June 58, 22p. Memo rept. no. 1150.
Order from LC mi$2.70, ph$4.80 PB 138 880

Various suggestions are made concerning an encoding device for the digital encoding of Russian Cyrillic scientific text. The device is intended as an input unit for mechanical translation equipment.

New York U. Coll. of Engineering, N. Y.
GENERALIZATION OF SHANNON-FEINSTEIN THEOREM TO COMMUNICATION SYSTEMS WITH FADING AND FEEDBACK, by S. S. L. Chang, B. Harris, and L. S. Schwartz. Scientific rept. no. 7 on Contract AF 19(604)1964. 30 Apr 59, 52p. 10 refs. AFCRC-TN-59-197; AD-215 937.
Order from LC mi$3.60, ph$9.30 PB 143 557

The noisy channel coding theorem is extended to systems having fading and feedback. The communication channel is presumed discrete with finite memory, and the varying channel conditions are described explicitly by a stochastic parameter. Of particular interest is the maximum rate at which information can be sent error-free over the channel. This rate is compared with the stationary and the ergodic capacities of the channel.

Radio Corp. of America, Camden, N. J.
DESIGN AND STUDY OF CORRELATION INSTRUMENTATION FOR SPEECH ANALYSIS AND SYNTHESIS, by G. F. Jacoby, G. J. Duscheck, and F. L. Putzrath. Scientific rept. no. 1 on Contract AF 19(604)4128. 31 Mar 59, 84p. 15 refs. AFCRC-TN-59-173; AD-214 415.
Order from LC mi$4.80, ph$13.80 PB 143 396

This report covers the studies leading to the selection of an optimum analog instrumentation for processing the output signal of a Vocoder for digital transmission over a standard voice channel. The system is based upon the matching of the incoming voice events against a catalog of speech patterns so that only the pattern number, rather than the speech event itself, need be transmitted. In the receiver, the proper speech pattern is retrieved from a similar memory and generates the required voltages for the Vocoder synthesizer. The recommended system features completely analog processing so that small deviations in the patterns can readily be accommodated. To minimize the number of electronic components and thus increase the equipment reliability, time sequential rather than parallel pattern matching is employed. A single magnetic storage drum is used as the pattern catalog. In duplex operation, it can serve simultaneously as part of the analyzer or synthesizer and can handle any desired number of voice channels.

Photographic Equipment

Air Force Missile Development Center, Holloman AFB, N. Mex.
POWER SPECTRAL ANALYSIS OF SLED VIBRATION DATA, by Herbert R. Lotze. Sep 58, 34p. 4 refs. AFMDC TN-58-12; AD-154 106.
Order from LC mi$3.00, ph$6.30 PB 138 861

A description is given of the analysis and processing of vibration data which originated from a sled run on the AFMDC Track. Different procedures of analysis are explained and compared with respect to applicability. Practical results were validated by the fact that the spectral densities obtained from analog and digital analysis show a very similar frequency characteristic.

Consolidated Electrodynamics Corp., Pasadena, Calif.
A MASS SPECTROMETER SYSTEM FOR MATERIALS: RESEARCH SUMMARY REPORT, PHASE I, by Charles F. Robinson, George D. Perkins, and Norton W. Bell. Rept. for 1 Apr 58-Jan 59 on Materials Analysis and Evaluation Techniques, Contract AF 33(616)5571. July 59, 31p. 17 refs. WADC Technical rept. 59-107; AD-216 714.
Order from OTS $1.00 PB 161 073

There are three areas in which mass spectrometry may be expected to contribute importantly to science and technology within the foreseeable future. They are (1) identification and estimation of minor components and trace impurities in solids; (2) structural studies of high-molecular weight materials; (3) identification and estimation of unknown materials by precise measurement of molecular weight. No mass spectrometer useful in all three of these fields has yet been built; however, the requirements on the

instrumentation for these fields have sufficient similarity to encourage the belief that a single high-performance mass resolving system, together with a limited number of ion source and ion detector modules, might be adaptable to any of these fields. This discussion is a report of the progress made during the first phase of a three-phase program of research and development on such a system.

Naval Ordnance Lab., Corona, Calif.
FOUNDATIONAL RESEARCH PROJECTS, JANUARY-MARCH 1959. Quarterly rept. June 59, 74p. 16 refs. NOLC rept. 454; NAVORD rept. 5955.
Order from LC mi$4.50, ph$12.30 PB 143 249

Contents:
Automatic programming, R. de la Briandais and R. Turco
Ferroelectric phenomena, D. J. White and H. H. Wieder
Ferromagnetic resonance, P. C. Archibald
Infrared atomic spectra, C. J. Humphreys and E. Paul, Jr.
Small antenna study, E. W. Seeley and J. G. Hoffman
(See also PB 140 352)

SOCIAL SCIENCES

Stanford U., Calif.
AN ALTERNATIVE PROOF OF THE STABILITY IN THE GROSS SUBSTITUTE CASE, by Hirofumi Uzawa. Technical rept. no. 60 on Contract N6onr-251(33). 8 Oct 58, 12p. 1 ref.
Order from LC mi$2.40, ph$3.30 PB 143 326

MISCELLANEOUS

Naval Research Lab., Washington, D. C.
REPORT OF NRL PROGRESS, Dec 59
Order from OTS $1.25, $10.00/year PB 151 345

Contents:
Articles:
The $He^3(\alpha, \gamma)Be^7$ and $H^3(\alpha, \gamma)Li^7$ reactions and their astrophysical importance, by H. D. Holmgren and R. L. Johnston
The dawn sky during the solar eclipse (October 1959), by R. Tousey
Toward a solution of the problem of hydrogen embrittlement of high-strength steels, by B. F. Brown
Scientific Program:
Applications Research: Use of quickening in one coordinate of a two-dimensional tracking system
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Solid State Physics: Color centers in cesium halides. Threshold energy for lattice displacement in α-Al_2O_3
Supporting Techniques: Multiple magnet wire specimen holder reduces test variables

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General

Blast and fallout prediction units--operation plumbbob, by J. W. Reed. Sandia Corp., Albuquerque, N. Mex. May 57. Contract AT(29-1)-789. 12p. Order from LC. Mi $2.40, ph $3.30. SCTM-186-57-51

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Metabolism of strontium, cesium and yttrium by animals, by P. B. Pearson. Atomic Energy Commission, Division of Biology and Medicine. June 55. 17p. Order from LC. Mi $2.40, ph $3.30. M-7120

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A Univac program for the analysis of radioactive decay curves, by D. S. Harmer. Brookhaven National Laboratory, Associated Universities, Inc., Upton, N. Y. Mar 59. 11p. Order from OTS. 50 cents. BNL 544 (T-141)

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Belgium. [nd]. 17p. Order from LC. Mi $2.40, ph $3.30. NP-7782

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Experimental study of plasma Alfvén-wave properties, by J. M. Wilxox, F. I. Beley, and A. W. De Silva. University of California. Lawrence Radiation Laboratory, Berkeley, Calif. Aug 59. Contract W-7405-eng-48. 22p. Order from OTS. 75 cents. UCRL-8885

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Analysis of neutron pulses in a Godiva-type reactor, by C. W. Nestor and M. Tobias. Oak Ridge National Laboratory, Oak Ridge, Tenn. Feb 59. Contract W-7405-eng-26. 16p. Order from LC. Mi $2.40, ph $3.30. CF-59-2-78

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Preliminary report on uranium deposits in the Gulf Coastal Plain, Southern Texas, by S. R. Steinhauser and E. P. Beroni. Including a section on: Radiometric airborne survey of parts of Karnes, Atascosa, and Live Oak Counties, Texas, by R. G. Blair. Denver Exploration Branch, Atomic Energy Commission, Division of Raw Materials, Denver, Colo. Nov 55. 44p. Order from OTS. $1.25. RME-1068

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Test on models of nuclear reactor elements. III. Head losses in core sub-assemblies, by J. S. McNown, R. A. Yagle, and A. Spengos. Michigan. Univ., Engineering Research Institute, Ann Arbor, Mich. July 57. 22p. Order from LC. Mi $2.70, ph $4.80. AECU-3757 (Pt. III)

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The creep behavior of zircaloy-2, by J. D. Lubahn. Knolls Atomic Power Laboratory, Schenectady, N. Y. June 59. Contract W-31-109-Eng-52. 13p. Order from LC. Mi $2.40, ph $3.30. KAPL-M-JDL-1

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An investigation of B_4C-zircaloy-2 size distributions using the cintel flying spot particle resolver, by R. J. Allio, P. A. Oldow, and L. G. Wisnyi. Knolls Atomic Power Lab., Schenectady, N. Y. July 59. Contract W-31-109-Eng-52. 32p. Order from LC. Mi $3.00, ph $6.30. KAPL-M-RA-4

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Fundamentals of sintering - IV. Fourth annual progress report covering period July 1, 1958 through June 30, 1959, by J. Brett, L. S. Castelman, and L. Seigle. Sylvania Research Laboratories, A Division of Sylvania Electric Products, Inc., Bayside, N. Y. June 59. Contract AT(30-1) 2102. 33p. Order from OTS. $1.00. SEP-254

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State properties of liquid and solid xenon: A bibliography, by S. R. Harris and H. S. Stearns. Los Alamos Scientific Laboratory, Los Alamos, N. Mex. Oct 57. Contract W-7405-eng-36. 14p. Order from LC. Mi $2.40, ph $3.30. AECU-4247

Matrices for transforming Legendre polynomial coefficients between laboratory and center of mass systems, by R. O. Lane, W. F. Miller and K. E. Hillstrom. Argonne National Laboratory, Lemont, Ill. Aug 59. Contract W-31-109-eng-38. 71p. Order from OTS. $2.00. ANL-6039

A numerical solution to the angle-integrated Boltzmann equation, by J. H. Bennett, and J. R. Terrall. General Electric. Atomic Products Division, Aircraft Nuclear Propulsion Department, Cincinnati, Ohio. Nov 58. Contracts AF 33 (600)-38062 and AT(11-1)-171. 12p. Order from OTS. 50 cents. APEX-520

Analysis of vane-type air motors, by B. Kaplan. General Electric. Atomic Products Division, Aircraft Nuclear Propulsion Department, Cincinnati, Ohio. Nov 57. Contracts AF 33 (600)-38062 and AT(11-1)-171. 24p. Order from OTS. 75 cents. APEX-522

Collision probabilities and resonance integrals for lattices, by W. Rothenstein. Brookhaven National Laboratory, Associated Universities, Inc., Upton, N. Y. June 59. 18p. Order from OTS. 75 cents. BNL 563 (T-151)

The use of sodium reactor coolant as a source of gamma radiation, by B. Manowitz and D. M. Richman. Brookhaven National Laboratory, Upton, N. Y. Mar 58. 13p. Order from LC. Mi $2.40, ph $3.30. BNL-3703

Slow neutron resonances in Ag, Ta, and Cd, by S. Desjardins. Pupin Cyclotron Laboratory, and George B. Pegram Laboratory, Columbia University, N. Y. May 59. Contract AT(30-1)-Gen-72. 114p. Order from OTS. $2.50. CU-189

Neutron cross sections of tellurium, by C. J. Heindl. Pupin Cyclotron Laboratory and George B. Pegram Laboratory, Columbia University, N. Y. June 1959. Contract AT(30-1)-GEN-72. 75p. Order from OTS. $2.00. CU-192

IBM 650 routine IV: Solution of heat diffusion equation, by R. R. Haefner. E. I. du Pont de Nemours & Co. Explosives Department, Atomic Energy Division, Technical Division, Savannah River Laboratory, Aiken, S. Car. July 59. Contract AT(07-2)-1. 70p. Order from OTS. $2.00. DP-384

The influence of specular reflection on the permability of porous media, by D. N. Lassettre. Oak Ridge Gaseous Diffusion Plant, Oak Ridge, Tenn. Sep 56. Contract W-7405-eng-26. 32p. Order from LC. Mi $3.00, ph $6.30. K-1258

A small magnetic core digital computer for special applications, by E. W. Hagen. Union Carbide Nuclear Company, Division of Union Carbide Corporation, Oak Ridge Gaseous Diffusion Plant, Oak Ridge, Tenn. Oct 59. Contract W-7405-eng-26. 131p. Order from OTS. $2.75. K-1434

Hydraulic instability of reactor parallel-plate fuel assemblies, by E. B. Johansson. Knolls Atomic Power Laboratory, Schenectady, N. Y. July 59. Contract W-31-109-Eng-52. 43p. Order from LC. Mi $3.30, ph $7.80. KAPL-M-EJ-9

Some formulae for average self-shielding factors, J. H. Smith. Knolls Atomic Power Laboratory, Schenectady, N. Y. June 59. Contract W-31-109-Eng-52. 12p. Order from LC. Mi $1.80, ph $1.80. KAPL-M-JHS-6

Numerical stress analysis for thin conical shells with non-uniform wall thickness subjected to axisymmetric loads, by L. Deagle. Knolls Atomic Power Labaratory, Schenectady, N. Y. July 59. Contract W-31-109-Eng-52. 35p. Order from LC. Mi $3.00, ph $6.30. KAPL-M-LD-3

NILT--Numerical inversion of Laplace transforms, by C. R. Mullin and R. A. Pfeiffer. Knolls Atomic Power Laboratory, Schenectady, N. Y. Aug 59. Contract W-31-109-52. 15p. Order from LC. Mi $2.40, ph $3.30. KAPL-M-RAP-1

Hafnium slab rod experiments in the PMA, by T. F. Ruane. Knolls Atomic Power Laboratory, Schenectady, N. Y. July 59. Contract W-31-109-Eng-52. 16p. Order from LC. Mi $2.40, ph $3.30. KAPL-M-TFR-11

Numerical methods for solving linear systems and applications to elliptic difference equations, by C. E. Lee and P. M. Stone. Los Alamos Scientific Laboratory, University of California, Los Alamos, N. Mex. Sep 58. Contract W-7405-ENG-36. 96p. Order from OTS. $2.50. LA-2314

An optical fallout analogue, by G. L. Felt. Los Alamos Scientific Laboratory, N. Mex. Oct 55. Contract W-7405-eng-36. 77p. Order from LC. Mi $4.50, ph $12.30. LAMS-1961

Pressure balance in a toroidal pinch, by B. R. Suydam. Los Alamos Scientific Laboratory, N. Mex. Dec 58. Contract W-7405-eng-36. 17p. Order from LC. Mi $2.40, ph $3.30. LAMS-2282

Floco II manual, by B. G. Carlson, C. S. Kazek, Jr., and C. E. Lee. Los Alamos Scientific Laboratory, University of California, Los Alamos, N. Mex. Aug 59. Contract W-7405-ENG-36. 55p. Order from OTS. $1.50. LAMS-2339

Concerning the $\nu/N \to 1/3$ resonance, V analysis of the equation $\frac{d^2v}{ds^2} + \left(\frac{2\nu}{N}\right)^2 v - \frac{b}{2}(\cos 2s)\, v^2 - \lambda\left(\cos\frac{2s}{3}\right) = 0$, by L. J. Laslett and S. J. Wolfson. Midwestern Universities Research Association, Madison, Wis. Aug 59. Contract AT(11-1)-384. 40p. Order from OTS. $1.00. MURA-497

Theory of the fixed frequency cyclotron, by G. Parzen. Midwestern Universities Research Association, Madison, Wis. Aug 59. Contract AT(11-1)-384. 5p. Order from OTS. 50 cents. MURA-498

Background in the neighborhood of a colliding beam region, by D. B. Lichtenberg and L. W. Jones. Midwestern Universities Research Association, Madison, Wis. Aug 59. Contract AT(11-1)-384. 19p. Order from OTS. 50 cents. MURA-499

Measurement of the SRE and KEWB prompt neutron lifetime using random noise and reactor oscillation techniques, by C. W. Griffin and J. G. Lundholm, Jr. Atomics International. A Division of North American Aviation, Inc. Canoga Park, Calif. Oct 59. Contract AT(11-1)-GEN-8. 32p. Order from OTS. $1.00. NAA-SR-3765

Boundary perturbation theory applied to a bare truncated sphere, by J. J. McClure and P. Inman. Atomics International. A Division of North American Aviation, Inc., Canoga Park,

Calif. Oct 59. Contract AT(11-1)-GEN-8. 16p. Order from OTS. 50 cents. NAA-SR-4039

The power noise transfer function of a reactor, by M. N. Moore. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. Oct 59. Contract AT (11-1)-GEN-8. 15p. Order from OTS. 75 cents. NAA-SR-4197

Use of an IBM 650 to calculate cloud chamber events, by R. Bingham, D. Tyoko, and L. McDermott. Columbia University. Nevis Cyclotron Laboratories, Irvington-on-Hudson, N. Y. Nov 57. Contract N6-ori-110, Task No. 1 and AT(30-1)-1932. 27p. Order from LC. Mi $2.70, ph $4.80. NEVIS-59

Quasi-tridiagonal matrices and type-insensitive difference equations, by S. Schechter. New York University. Atomic Energy Commission Computing and Applied Mathematics Center, N. Y. May 59. 25p. Order from LC. Mi $2.70, ph $4.80. NYO-2542

Nuclear characteristics of spherical, homogeneous, two-region, molten-fluoride-salt reactors, by L. G. Alexander, D. A. Carrison, H. G. MacPherson and J. T. Roberts. Oak Ridge National Laboratory, Reactor Projects Division, Oak Ridge, Tenn. [nd]. Contract W-7405-eng-26. 21p. Order from OTS. 75 cents. ORNL-2751

The fast-neutron multiplication effect of beryllium in reactors, by W. Häfele. Oak Ridge National Laboratory, Neutron Physics Division, Oak Ridge, Tenn. [nd]. Contract W-7405-eng-26. 36p. Order from OTS. $1.25. ORNL-2779

Thermoluminescence studies of the gamma-irradiated ferroelectrics Rochelle salt and guanidine aluminum sulfate hexahydrate, by J. W. Gilliland, Jr. Oak Ridge National Laboratory, Health Physics Division, Oak Ridge, Tenn. [nd]. Contract W-7405-eng-26. 51p. Order from OTS. $1.50. ORNL-2783

Preliminary report on measurement of soil stresses caused by an underground explosion, by W. R. Perret. Sandia Corporation, Albuquerque, N. Mex. Mar 52. 16p. Order from OTS. 75 cents. SC-2278(TR)

Sandia dust tube: Development and an experiment, by J. R. Banister and W. T. Parker. Sandia Corporation, Albuquerque, N. Mex. Sep 59. 35p. Order from OTS. $1.25. SC-4333(TR)

Radial eigenfunctions, phase shifts, total elastic, differential elastic, and momentum transfer cross sections for electrons scattered from oxygen and nitrogen atoms, by W. J. Byatt, F. O. Lane, Jr., and L. D. Watkins. Sandia Corporation, Albuquerque, N. Mex. Oct 59. 44p. Order from OTS. $1.25. SC-4363(TR)

Atomospheric turbulence, by H. A. Panofsky. Sandia Corporation, Research Colloquium, Albuquerque, N. Mex. Sep 59. 17p. Order from OTS. 50 cents. SCR-118

Results of a force test of four configurations of the Hi-Lo instrumented and chaff rockets in the Sandia Corporation 12 x 12 inch transonic wind tunnel (program III-46), by J. W. Arnold. Sandia Corporation, Albuquerque, N. Mex. Sep 59. 61p. Order from OTS. $1.50. SCTM 299-59(51)

An analytical and experimental investigation of the steady-state flow in small bore tubing with reduced size straight-through fittings connected at the tubing extremities, by A. L. Ducoffe. Sandia Corporation, Albuquerque, N. Mex. July 59. Contract AT(29-1)-789. 31p. Order from LC. Mi $3.30, ph $7.80. SCTM-222-59(57)

One-dimensional compressible flows of magneto-hydrodynamics. II, by O. G. Owens. Sandia Corporation, Albuquerque, N. Mex. Nov 55. 13p. Order from LC. Mi $2.40, ph $3.30. SCTM-239-55(51)

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The price of containing radioactivity in digging craters, by B. F. Murphey. Sandia Corporation, Albuquerque, N. Mex. Oct 58. Decl. Apr 59. Contract AT(29-1)-789. 6p. Order from LC. Mi $1.80, ph $1.80. SCTM-384-58-51

The problem of measuring the absolute yield of 14-Mev neutrons by means of an alpha counter, by J. Benveniste, A. C. Mitchell, C. D. Schrader, and J. H. Zenger. University of California, Lawrence Radiation Laboratory, Livermore, Calif. June 59. Contract W-7405-eng-48. 22p. Order from OTS. 75 cents. UCRL-5619

Antiproton interactions in hydrogen and carbon below 200 Mev, by L. E. Agnew, Jr. Univer-

sity of California. Lawrence Radiation Laboratory, Berkeley, California. July 59. Contract W-7405-eng-48. 93p. Order from OTS. $2.50. UCRL-8785

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Inversion of the angular-momentum expansion of meson photoproduction amplitudes, by J. A. Ball. University of California. Lawrence Radiation Laboratory, Berkeley, Calif. Aug 59. Contract W-7405-eng-48. 11p. Order from OTS. 50 cents. UCRL-8858

Span-2 - an IBM-704 code to calculate uncollided flux outside a circular cylinder, by P. A. Gillis, T. J. Lawton, and K. W. Brand. Bettis Plant, Westinghouse Electric Corporation, Bettis Atomic Power Division, Pittsburgh, Pa. Aug 59. Contract AT-11-1-GEN-14. 44p. Order from OTS. $1.25. WAPD-TM-176

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Progress report for January, February, March 1959 to the United States Atomic Energy Commission. Pupin Cyclotron Laboratory and George B. Pegram Laboratory, Columbia University, N. Y. Contract AT-30-1-GEN-72. 34p. Order from LC. Mi $3.00, ph $6.30. CU-191

Quarterly status report of the LASL plasma thermocouple development program for period ending September 20, 1959, by S. Glasstone. Los Alamos Scientific Laboratory. University of California, Los Alamos, N. Mex. Oct 59. Contract W-7405-ENG-36. 15p. Order from OTS. 50 cents. LAMS-2364

Applications of ultrasonic energy. Progress report no. 14 covering period from February 1, 1959 to March 31, 1959. Aeroprojects, Inc., West Chester, Penna. Apr 59. Contract AT(30-1)-1836. 45p. Order from LC. Mi $3.30, ph $7.80. NYO-2568

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A review of the laboratory's activities and program. Progress report for period ending July 31, 1959, by R. S. Stone and others. Radiological Laboratory, University of California, School of Medicine, San Francisco, Calif. Sep 59. Contract AT-11-1-GEN-10. 46p. Order from OTS. $1.50. USCF-19

Radiation Effects on Materials

The radiolysis of prospective organic reactor coolants. Report no. 13, by W. W. West and others. California Research Corporation, Richmond, Calif. Aug 59. Contract AT(11-1)-174. 34p. Order from OTS. $1.00. AECU-4295

Fundamentals of fission damage, by J. A. Brinkman. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. Oct 59. Contract AT(11-1)-GEN-8. 34p. Order from OTS. $1.00. NAA-SR-4164

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Study of liquid and solid waste disposal requirements, by M. Armando, R. Corcoran and others. Allis-Chalmers Manufacturing Company, Nuclear Power Department, Milwaukee, Wis. July 59. Contract AT(11-1)-589. 75p. Order from OTS. $2.00. ACNP-5916

Corrosion film removal as an indication of decontamination effectiveness, by R. D. Weed. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. Nov 58. Contract AT(45-1)-1350. 20p. Order from LC. Mi $2.40, ph $3.30. HW-58126

Quarterly progress report research and development activities radioactive waste fixation, January - March, 1959, by D. W. Pearce and others. Hanford Atomic Products Operation, Chemical Research and Development Operation, Richland, Wash. Apr 59. Contract W-31-109-Eng-52. 14p. Order from OTS. 50 cents. HW-60584

Reactors—General

Circulating loops for testing organic coolants, by J. G. Carroll. California Research Corporation, Richmond, Calif. June 59. Contract AT(11-1)-

174. 75p. Order from OTS. $2.00.
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Physics analyses of the treat reactor design, by Haig P. Iskenderian. Argonne National Laboratory, Lemont, Ill. Aug 59. Contract W-31-109-eng-38. 48p. Order from OTS. $1.50.
ANL-6025

Calculation of the temperature dependence of Pu^{239}/U^{235} fission ratio for a graphite-U^{235} system, by D. Meneghetti and K. E. Phillips. Argonne National Laboratory, Lemont Ill. Sep 59. Contract W-31-109-eng-38. 13p. Order from OTS. 50 cents. ANL-6058

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Liquid metal fuel reactor experiment. The effect of slurry inhomogeneity on nuclear stability of liquid metal fuel reactors, January 29, 1959, by H. E. Zellnik, W. E. Miller, and C. E. Thomas. The Babcock & Wilcox Company, Atomic Energy Division. Contract AT(30-1)-1940. 37p. Order from OTS. $1.25.
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Lecture notes on reactor controls, by C. S. Walker. Oak Ridge National Laboratory, Oak Ridge, Tenn. June 54. Contract W-7405-eng-26. 182p. Order from LC. Mi $8.40, ph $28.80.
CF-59-6-90

Investigation of temperature coefficients obtained from pressure test reactor, by G. D. Hickman and J. A. Bistline. Knolls Atomic Power Laboratory, Schenectady, N. Y. July 59. Contract W-31-109-Eng-52. 39p. Order from I C. Mi $3.00, ph $6.30. KAPL-M-GDH-1

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Survey of the physics, metallurgy, and engineering aspects of reactor control materials, by Vallecitos Atomic Laboratory and Engineering Section, Atomic Power Equipment Department, San Jose, Calif. June 59. Contract AT(04-3)-189. 398p. Order from OTS. $3.50.
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Metal-water reactions: III. Fuel element stresses during a nuclear accident, by K. M. Horst. Atomic Power Equipment Department, General Electric Company, San Jose, Calif. July 59. Contract AT(04-3)-189. 27p. Order from OTS. 75 cents. GEAP-3191

Physics of intermediate reactors. Supplement, by C. B. Mills. Los Alamos Scientific Laboratory, University of California, Los Alamos, N. Mex. Apr 59. Contract W-7405-ENG-36. 79p. Order from OTS. $2.00.
LAMS-2288(Suppl. 1)

Experimental evaluation of a concentric-cylinder, spiral-flow heat exchanger, by J. S. McDonald. Atomics International. Division of North American Aviation, Inc., Canoga Park, Calif. Oct 59. Contract AT(11-1)-GEN-8. 34p. Order from OTS. $1.00. NAA-SR-3747

A siphon break as a blocking valve, by J. McDonald and W. Marten. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. Oct 59. Contract AT(11-1)-GEN-8. 30p. Order from OTS. 75 cents.
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Industrial process and space heat from nuclear reactors. A literature search, by J. M. Jacobs. Atomic Energy Commission, Technical Information Service Extension, Oak Ridge, Tenn. Oct 59. 9p. Order from OTS. 50 cents. TID-3537

U. S. Papers of the Sixth International Congress and Exhibition of Electronics and Atomic Energy at Rome, Italy. Division of International Affairs United States Atomic Energy Commission, Oak Ridge, Tenn. Oct 59. 83p. Order from OTS. $2.25. TID-7579

Nuclear materials control system, Phase II. The feasibility of an annular core reactor as a reactor fuels measuring device, by G. E. Putman.

Westinghouse Electric Corp., Atomic Power Dept., Pittsburgh, Pa. May 59. Contract AT (30-1)-2176, Task 1. 75p. Order from LC. Mi $4.50, ph $12.30. WCAP-1192

Nuclear materials control system, Phase II. The feasibility of an annual nuclear core as a reactor fuels measuring facility, by J. A. Vreeland. Westinghouse Electric Corp., Atomic Energy Dept., Pittsburgh, Pa. June 59. Contract AT930-1)-2176, Task 1. 25p. Order from LC. Mi $2.70, ph $4.80. WCAP-1221

Nuclear materials control system, Phase II. A design for the evaluation of a reactor fuels measurement facility, by W. J. Rusnack. Westinghouse Electric Corp., Atomic Power Dept., Pittsburgh, Pa. June 59. Contract AT(30-1)-2176. 31p. Order from LC. Mi $3.00, ph $6.30. WCAP-1232

Reactors—Power

Decay heat removal system. Section I. Second performance. First issue. Duquesne Light Co., Shippingport, Pa. May 59. 3p. Order from LC. Mi $1.80, ph $1.80. AECU-4213

Core I control rod drive mechanisms periodic tests. Section I. Eight performance. First issue. Duquesne Light Co., Shippingport, Pa. May 59. 11p. Order from LC. Mi $2.40, ph $3.30. AECU-4214

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Periodic reactor plant container air locks and 48-inch butterfly valves leakage and performance test. Section II. First performance. First issue. Duquesne Light Co., Shippingport, Pa. May 59. 5p. Order from LC. Mi $1.80, ph $1.80. AECU-4222

Failed element detection and location system (operational) test. Section I. First issue. Duquesne Light Co., Shippingport, Pa. May 59. 9p. Order from LC. Mi $1.80, ph $1.80. AECU-4223

Fuel defect test - borax - IV, by R. F. S. Robertson and V. C. Hall, Jr. Argonne National Laboratory, Reactor Engineering Division. Oct 59. Contract W-31-109-eng-38. 42p. Order from OTS. $1.25. ANL-5862

HRT mockup iodine removal and recombiner tests, by P. H. Harley. Oak Ridge National Laboratory, Oak Ridge, Tenn. Jan 58. Contract W-7405-eng-26. 12p. Order from LC. Mi $2.40, ph $3.30. CF-58-1-138

Summary of HRT run 14, by J. R. Engel, P. N. Haubenreich, J. O. Kolb, and D. M. Richardson. Oak Ridge Natinnal Laboratory, Tenn. June 59. Contract W-7405-eng-26. 79p. Order from LC. Mi $4.50, ph $12.30. CF-59-6-96

Investigation of mechanical methods of scale removal from HRT heat exchangers, by C. H. Gabbard, D. M. Eissenberg, J. C. Moyers, and I. K. Namba. July 59. Contract W-7405-eng-26. 8p. Order from LC. Mi $1.80, ph $1.80. CF-59-7-102

Heavy water moderated power reactors. Quarterly progress report for February, March, and April 1959, by D. F. Babcock and L. Isakoff. E. I. du Pont de Nemours & Co. Explosives Department, Atomic Energy Division, Technical Division, Wilmington, Del. July 59. Contract AT(07-2)-1. 115p. Order from OTS. $2.50. DP-385

Process development pile measurements of lattice parameters of natural uranium in heavy water, by N. P. Baumann and others. E. I. du Pont de Nemours & Co., Explosives Department, Atomic Energy Division, Technical Division, Savannah River Laboratory, Aiken, S. Car. July 59. Contract AT(07-2)-1. 31p. Order from OTS. $1.00. DP-407

Army gas-cooled reactor systems program. Preliminary hazards summary report for the ML-1 Nuclear Power Plant. Aerojet-General Nucleonics, San Ramon, Calif. Apr 59. Contract AT(10-1) 880. 213p. Order from OTS. $3.50. IDO-28537

Development of the SRE thimble-type control rods Mark I and II, by A. E. Miller. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. Oct 59. Contract AT(11-1)-GEN-8. 62p. Order from OTS. $1.75. NAA-SR-2011

Fuel programming for sodium graphite reactors, by T. J. Connolly. Atomics International. A Division of North American Aviation, Inc. Canoga Park, Calif. Oct 59. Contract AT(11-1)-GEN-8. 34p. Order from OTS. $1.00. NAA-SR-4040

Induction heating tests in the hallam nuclear power facility development program, by H. W. Lohman. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. Nov 59. Contract AT(11-1)-GEN-8. 31p. Order from OTS. 75 cents. NAA-SR-4206

Aluminum chloride as a thermodynamic working fluid and heat transfer medium, by M. Blander, L. G. Epel, A.P. Fraas, and R. F. Newton. Oak Ridge National Laboratory, Reactor Projects Division, Oak Ridge, Tenn. [nd]. Contract W-7405-eng-26. 29p. Order from OTS. $1.00. ORNL-2677

A preliminary study of a direct-cycle steam-cooled reactor for merchant ship propulsion, by H. L. Falkenberry, R. S. Holcomb, and G. Samuels. Oak Ridge National Laboratory, Reactor Projects Division, Oak Ridge, Tenn. [nd]. Contract W-7405-eng-26. 17p. Order from OTS. 75 cents. ORNL-2759

Small-sized organic moderated reactors (10 - 40 MWE). Atomics International. A Division of North American Aviation, Inc., Canoga park, Calif. Oct 59. 43p. Order from OTS. $1.25. TID-8511

Evaluation of ion exchange resins for use in the Yankee reactor. Westinghouse Electric Corp., Atomic Power Department, Pittsburgh, Pa. July 59. Contract AT(30-3)-222, Subcontract No. 1. 36p. Order from LC. Mi $3.00, ph $6.30. YAEC-115

Yankee Project. Quarterly progress report for the period January 1 to March 31, 1959, by H. E. Walchli. Westinghouse Electric Corp., Atomic Power Department, Pittsburgh, Pa. May 59. Contract AT(30-3)-222. 75p. Order from OTS. $2.25. YAEC-125

Stable Isotope Separation

Thermal diffusion: A bibliography, by G. R. Grove. Monsanto Chemical Company, Mound Laboratory, Research and Engineering Division, Miamisburg, Ohio. June 59. Contract AT-33-1-GEN-53. 58p. Order from OTS. $1.75. MLM-1088

Technology—Feed Materials

Oxide fluorination tower, by L. C. Peoples. Goodyear Atomic Corporation, Technical Division, Chemistry Department, Portsmouth, Ohio. Aug 59. Contract AT(33-2)-1. 24p. Order from OTS. 75 cents. GAT-252

Process development quarterly report, by J. U. Shepardson and J. A. Nelson. Mallinckrodt Chemical Works, Uranium Division, Weldon Spring, Mo. Nov 59. Contract W-14-108-Eng-8. 101p. Order from OTS. $2.50. MCW-1433

De-entrainment of organic extract by electrostatic precipitation, by W. C. Philoon and J. T. Krieg. Mallinckrodt Chemical Works, Uranium Division, Weldon Spring, Mo. Nov 59. Contract W-14-108-Eng-8. 9p. Order from OTS. 50 cents. MCW-1437

Engineering evaluation of semi-works ADU production, by D. J. Loudin. National Lead Company of Ohio, Technical Division, Cincinnati, Ohio. Mar 59. Contract AT(30-1)-1156. 24p. Order from OTS. $1.00. NLCO-786

Induction heating tests in the hallam nuclear power facility development program, by H. W. Lohman. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. Nov 59. Contract AT(11-1)-GEN-8. 31p. Order from OTS. 75 cents. NAA-SR-4206

Aluminum chloride as a thermodynamic working fluid and heat transfer medium, by M. Blander, L. G. Epel, A. P. Fraas, and R. F. Newton. Oak Ridge National Laboratory, Reactor Projects Division, Oak Ridge, Tenn. [nd]. Contract W-7405-eng-26. 29p. Order from OTS. $1.00. ORNL-2677

A preliminary study of a direct-cycle steam-cooled reactor for merchant ship propulsion, by H. L. Falkenberry, R. S. Holcomb, and G. Samuels. Oak Ridge National Laboratory, Reactor Projects Division, Oak Ridge, Tenn. [nd]. Contract W-7405-eng-26. 17p. Order from OTS. 75 cents. ORNL-2759

Small-sized organic moderated reactors (10 - 40 MWE). Atomics International. A Division of North American Aviation, Inc., Canoga park, Calif. Oct 59. 43p. Order from OTS. $1.25. TID-8511

Evaluation of ion exchange resins for use in the Yankee reactor. Westinghouse Electric Corp., Atomic Power Department, Pittsburgh, Pa. July 59. Contract AT(30-3)-222, Subcontract No. 1. 36p. Order from LC. Mi $3.00, ph $6.30. YAEC-115

Yankee Project. Quarterly progress report for the period January 1 to March 31, 1959, by H. E. Walchli. Westinghouse Electric Corp., Atomic Power Department, Pittsburgh, Pa. May 59. Contract AT(30-3)-222. 75p. Order from OTS. $2.25. YAEC-125

Stable Isotope Separation

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Technology—Feed Materials

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